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BIRDS AND SERPENTS

By ARCHIBALD RUTLEDGE

Illustrated by Edmund J. Sawyer

LOVERS of Nature, if they are wise, will not take an entirely idyllic view of the life of the fields and forests. They will recognize the shadows along with the sunlight, the weeds along with the wildflowers; and, without attempting to explain why, they will be aware that in Nature there are ancient vendettas. Among these feuds, one of the most interesting for human consideration is that of the serpent and the bird.

Perhaps the first thing we should notice is that the snake is by no means always the predator, and the bird the victim. Eagles, hawks, owls, herons, and even turkeys and chickens destroy reptiles. I have seen the marvelous swallow-tailed kite, a bird that is to me the last word in speed and grace, volplane from the zenith, skim like a glimmering ray of light the darksome edge of a lagoon, and, apparently without pause, seize a snake from a sedgerack, and bear it out of sight over the tree-tops. Of all the young snakes born, probably half of them are killed by enemies while they are still young and comparatively defenceless; and of these enemies, birds are among the foremost.

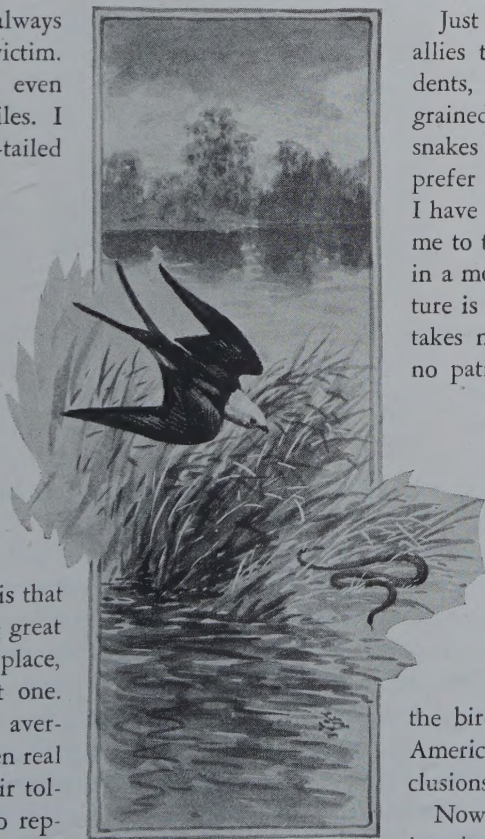
Another thing to be remembered is that the serpent is not wholly bad. In the great scheme of things he has a legitimate place, and his office is often a beneficent one. Racial superstition accounts for the average person's antipathy to snakes; even real lovers of Nature seldom extend their toleration, much less their affection, to reptiles. But in their defence it is to be considered that they prey on many things that are the foes of the wild things we love. The kingsnake destroys the rattler,

the copperhead, and the dread cottonmouth moccasin; the mussurama kills the fer-de-lance and the great bush-master—called by the natives of his haunts La Cascabela Muda—the rattler without bells. Again, snakes, especially the venomous ones, feed largely on rodents; and without this natural control put on red squirrels, rats, and mice, whole species of birds, I think, would come near to extinction. Reptiles help to keep the balance of Nature.

Just as certain hawks and owls are our allies through being the enemies of rodents, so are most serpents. Yet so ingrained in human nature is the dislike of snakes that I have found that most people prefer never to mention them; and when I have written of them, readers have taken me to task as severely as if I had behaved in a morally interrupted manner. But Nature is so ancient, wise, and sane that she takes no account of our foibles and has no patience with our prejudices; and if we would really understand her, we have to approach her with a sanity and an honesty that savor of her own.

As it is necessary for me to prescribe bounds for myself in the discussion of this subject that is both vast and various in its details, I shall limit what I have to say to my own observations on the birds and reptiles of Eastern North America; and I shall draw certain conclusions from those observations.

Now, things are seldom as bad as our imagination makes them; and we are often prone to believe that every swamp and woodland is haunted by venomous snakes. I guess that in my more than forty



THE SWALLOW-TAILED KITE
SKIMS LIKE A GLIMMERING
RAY OF LIGHT TO SEIZE A
SNAKE

years of roaming the wilds I have been in about as much snaky country as the average man; but in two places only have I found venomous snakes really numerous: one is in the mountains of Pennsylvania (and the same thing would be true of New York, Virginia, West Virginia, Tennessee, and North Carolina), where certain snakes have perhaps the fortunate habit of occupying rock-dens, near which hundreds may be found, but far from which few ever stray. Rarely is one of these venomous serpents seen in the wide cultivated valleys; and I have rambled the mountains for days without ever seeing one. However, I know where to find them if I have a mind to do so.

The other region that is snake-infested is the great coastal plain of the Carolinas, Georgia, and the Gulf States, where the cottonmouth abounds, where the lethal coral-snake occurs, and where the copperhead, the timber-rattler, and the great diamondback are found. North of the latitude of Savannah, Georgia, these reptiles hibernate, in a more or less indifferent fashion, so that few are ever seen in the dead of winter. South of that latitude their appearance, even in midwinter, is to be expected, except in times of unusual cold. However, I have spent long periods in the wilds of those regions without ever encountering one of these serpents. They are nowhere abundant, except in the case of the cottonmouth, whose range is limited to regions close to lagoons, backwaters and sluggish streams. In that vast stretch of country, razorback hogs, forest fires and other enemies, including man, keep the natural increase of serpents severely checked. In my opinion, a forest fire destroys more snakes than all other agencies combined; and this destruction often takes place when the reptiles are hibernating in old logs, stumps, and trash-piles. Those escape that sleep in abandoned holes of wood-rats deep underground.

Many species of wildfowl are entirely free from attacks of snakes; for example, the shore-birds that nest on the beaches and in the salt marshes. However, on the barrier islands, where many of the ponds are brackish, I have found the moccasin killing both the old and the young, devouring the eggs of the marsh-hen, destroying the young of the beautiful and gentle wood-duck. In the great "reserves" or artificial freshwater lakes of the old plantations, to which the wood-duck mothers carry their young to give them their first lessons in swimming, moccasins take a heavy toll of these lovely elves; and the parents are subject to attack by the grim alligator.

All birds that nest in the freshwater marshes or in

low bushes along the banks of streams in that region suffer from the depredations of reptiles. It has been my observation that the cardinal is an especial victim; and I have always wondered whether the brilliant coloring of the male did not have something to do with attracting the serpent to the nest. Unless built pretty low to the ground, the nest will be safe from most snakes save the blacksnake and the chicken snake; yet I have found the moccasin near a bird-nest twelve feet from the ground, and a rattler fifteen feet from the ground, though a nest was not the objective of his climb. As a matter

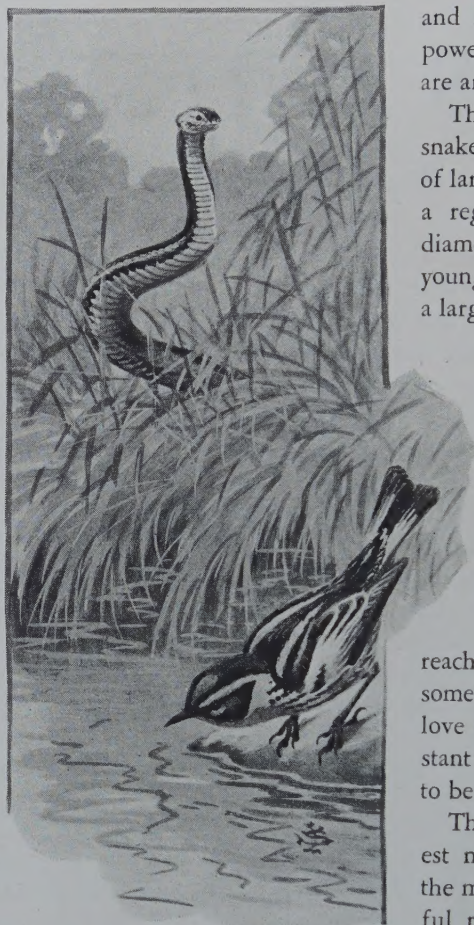
of fact, all snakes are good climbers, and most of them are graceful and powerful swimmers. No doubt they are ancestrally amphibious.

The birds that suffer most from snakes are small ones, or the young of larger species. Thus the quail forms a regular part of the diet of the diamondback; and I have found a young wild turkey in the stomach of a large timber rattler. Birds that haunt

the bushes and the ground are in the greatest danger; such birds as the thrushes, the towhee, the catbird, the cardinal, many of the sparrows and the mockingbird. Birds like the kingbird, the vireo and the bluejay are commonly immune because of their habit of frequenting elevations above the reach of snakes. Of course, they are sometimes killed, but the birds that love the ground are the ones in constant peril; that is, if they happen to be in snake country.

The time of year when the greatest number of birds is killed is in the mating season. According to careful records that I have kept over a great number of years, the twilight-time holds the greatest menace by snakes to birds. Emerging from their

dens and shelters late in the morning, serpents usually lie half-asleep until late in the afternoon, when they begin to prowl and forage. It is just at that time that birds are most unwary. Then even the warblers that have been haunting the treetops descend to drink; the brown thrashers and towhees take a last shuffle in the leaves; the veery, often from a low bush, gives his poignant dewy song. In snake country at such a time, I have seen a good many tragedies happen to birds; yet I am not convinced that they suffer so much as their worst enemies do. For every bird killed by a snake, I think a score will be destroyed by that pest, the red squirrel, which makes a specialty of eating the eggs and the young. To make things even, Nature gives the snake an insatiable appetite for the red squirrel. As I have



"EVEN THE WARBLERS DESCEND TO DRINK AND RISK THEIR LIVES"

already said, there is a nice balance here that would be imperiled if an attempt were made to kill all snakes.

A great many stories are told of the so-called "charming" of birds by reptiles, especially by the rattlesnake. This performance I have witnessed many times. But there seems nothing especially strange or occult in it. The dread presence of a rattler has the same terrifying effect on small animals as well as birds; and for that matter, on large animals as well. I have had more than one good horse literally go wild in the woods when he detected the odor of a diamondback. I have seen an old hound sit down and howl in the most lugubrious fashion when he came upon the scent of one of these chimeras.

The fluttering of a bird, and its cries of distress upon finding itself close to a serpent, are often due to the fact that it is attempting in a pitiful way to defend its nest or its young. At other times the bird may be simply hysterical with fear. I have seen human beings, under similar circumstances, behave in almost that identical fashion. It seems to be that it is a matter of being violently disconcerted, or almost scared to death, rather than being "charmed."

A singular performance is that of turkeys, wild or tame, when they come upon a snake. Once, in the early autumn, in the open pine-lands of the South I was privileged to see a flock of twenty-one wild turkeys discover a rattlesnake. The snake lay on an open arena of white sand, and about him the great birds formed a perfect circle, and kept moving in that circle around and around the puzzled reptile. All the while they kept up a querulous calling, half-frightened, half-threatening. I observed that they neither walked nor ran, but appeared to be performing some kind of dance such as we associate with rituals. From my place of hiding in the bay-bushes, I watched this strange spectacle for nearly half an hour. The turkeys never ventured near the rattler, and the rattler never left his coil. The dry song of his bells rose and fell with the increase and the diminishing of the birds' dancing and the intensity of their cries. At last the flock trooped away into the shadows of the wilderness, still complaining in treble tones of this intruder into their earthly paradise.

On one occasion I hauled a load of old pine logs from the woods. Some of these were hollow. Shortly after they had been unloaded in the backyard, I heard a hen crying out in great distress. Upon investigating

I found that she had discovered a rattler that had crawled from one of the hollow logs. This hen, about three feet from the snake, was literally pirouetting on her toes; and, though her plumage was normal, all her feathers were standing out like those on a frizzled chicken. She seemed unable to do a thing but stand there and call for help in the most hysterical way. Her frantic SOS attracted all the other chickens, which, however, kept their distance. Even though I safely dispatched the rattler, the hen was not wholly consoled. In fact, for a day or two she went about with a hunted look, and every now and then would give false cries of alarm. She had simply been unnerved.

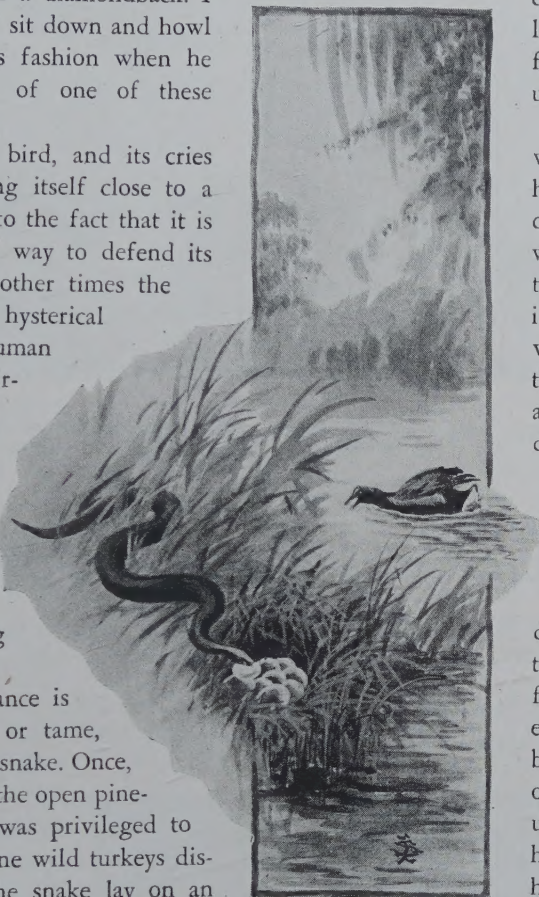
One spring I found the nest of a pileated woodpecker in a tall tree-bay. The birds had, with wonderful patience of labor, excavated the hole in the green and living wood. When I thought there were eggs in the nest, I essayed to climb to it, assisted in my ascent by some heavy wild grapevines growing on the tree. As I reached the hole, and as, holding on with my left arm, I crooked my right to put my hand down inside, a strange yet familiar odor came to me. Almost instantly I was on the ground. Going home to get an axe, I cut down the tree, and then split it open at the place of the excavation.

As I had supposed, there was a great diamondback in the hollow; and inside this great reptile were the mother bird and four eggs. This is the only observation I ever made on a rattlesnake's eating eggs; but doubtless he often does. My detection of the significance of that peculiar but not unpleasant odor probably saved my life. I had had enough of putting my hand into hollows to last me for a long, long time.

It appears that in a perfectly wild state of Nature serpents are often of distinct benefit; but in places frequented by man, certainly the venomous snake has no place;

and as regions become more and more settled and civilized, not only serpents, but other foes of birds disappear as well. Lovers of birds will agree with me that far more of these beautiful friends are to be found near home, where life is safer and more sheltered, than in the wilds, which, though alluring in unspoiled beauty, harbor foes to life and to that serenity that makes life an enjoyment rather than an endurance or a campaign for safety.

EDITOR'S NOTE: Archibald Rutledge, one of our leading writers on Nature, author of many books of prose and poetry and innumerable articles and stories, is a son of South Carolina. On the banks of the Santee River he has a plantation and few know as well as he the richness in wildlife of that region now threatened with destruction for power development. We have asked him to write about this threat and refer you to Page 173 of this issue.



"I HAVE FOUND THE
MOCCASIN DEVOUR-
ING THE EGGS OF THE
MARSH-HEN"



REDDY, THE COYOTE, AND HIS PAL, GOG

The dog's favorite hold was Reddy's tail, which, when twisted, would result in a session of fur-flying combat, following which all would be forgiven and play resumed

The Case of Reddy—A Coyote

By ELMO STEVENSON

REDDY didn't have a chance. Long before he was born man had decided to exterminate his kind, regardless of their biological value, for they are accused of numerous crimes. Loudest of rumors are these: All members of his family slay sheep and domesticated fowl. As an object of beauty he is best observed behind bars. In Nature he is a killer. As a pet he is mischievous, malodorous and even dangerous—he might snap somebody. Such is the coyote's dilemma.

Reddy had scarcely noted his home surroundings before he felt the hand of man. He was snatched from his den in the rolling, sagebrush-covered hills of Baker County in northeastern Oregon. He didn't like it but he was a weakling and his struggles for freedom were futile. His brothers and sisters were killed. He looked foxy enough except for his tail and wool. His face and ears were reddish brown. This dirty, brown, woolly, wobbly pup, later called Reddy, was saved for a purpose. Could he defend his case before a biased court?

Milk in a saucer was satisfying to Reddy after a jolting auto ride to the Grande Ronde Valley. The next day he learned to drink by a more primitive method, and displayed so much gusto and vigor in his bottle sucking that he was the delight of more than two thousand school children. He seemed to enjoy his audience almost as well.

Reddy soon learned his name, and that a whistle meant food. His hunger was insatiable. He learned that the

rustling of paper meant fun. Either it was to be torn or it was to be played with like a ball. If he brought it back to his friends, he received an approbatory stroking on his back. He liked that, so it was not long until he began to retrieve anything thrown. Best of all he liked to recover balls. Reddy soon learned how to stand up and walk on his hind legs. Jumping for his food from this position was a favorite sport.

Our pup had some bad traits. During his first two weeks of captivity, he would, without seeming cause, gnash his teeth. Often he would attack viciously the leg of a chair or table. These spells became fewer and fewer until they ceased entirely. Was it his wolfish nature, or was he troubled with colic? Reddy liked to chew on things, especially clothing on or off the owners. He enjoyed biting and pulling on one's hand or leg, dog fashion. At first he occasionally bit too hard, drawing blood. Housebreaking tactics were frustrated early in his career, as circumstances required Reddy's removal to the garage at night.

Our coyote's behavior was a mosaic of Nature and domesticity during his first few weeks in captivity. Sudden noises caused the young pup to stand up, run a short distance, and face the direction of the disturbance. He was easily conditioned for any kind of noise, and finally developed a passive-awareness for unusual noises. When permitted to get away from the car or us in sagebrush

REDDY AT ONE YEAR

It was at this age that considerations of legal and other natures decreed that the coyote must end his life in civilization

areas, he was prone not to heed our calling. His nose was ever his guide. Reddy thought that all dogs were friends and ran out to meet them, falling down and rolling over on his back, puppy like. Reddy had one trait that was most amusing to us, although not wholly understood. When placed on a linoleum-covered floor, he started bucking. He would bound straight up, and come down stiff-legged, arching his back.

When Reddy was a month old, he was joined by another species of his tribe, a hybrid Australian shepherd and collie pup of approximately the same age. Reddy and Gog fast became pals. That friendship was broken and renewed upon several occasions. Their play consisted of chasing each other around the yard, colliding and grappling. Gog's favorite hold was Reddy's tail. As the dog's legs were shorter than the coyote's, he was so much impedimenta, especially on the down hill turns. The result was a tumble for the dog, which twisted Reddy's tail. Then the fur flew; but soon one or the other started a new race.

The chief differences between the pals were the quicker reactions, the earlier and longer leg development and the more acute vision and hearing of the coyote. The "green devil" resided in both, though Gog was the more envious. This severed relations between the two on more than one occasion, usually after they had tangled. The coyote was the aggressor, and trickier in these conflicts. But neither seemed to be beaten. Upon the return of the coyote, then six months old, from a week's camping experience, there ensued a most vicious battle, with murder in both hearts. A separation was brought about, and ten minutes later the pals were romping about the garden. A six-weeks' absence of the dog soon followed this is-



PHOTOGRAPH BY C. V. AGER

sue. When the two were reunited there was another deathly struggle, in which the dog suffered most before a separation could be maneuvered. After this battle, the dog's distrust of Reddy never permitted him to rollick long. Up until the last, the coyote thought nothing of tackling any dog.

We wondered which learned the easier. The trick of rolling over was selected for a test case. Both were given five trials two times a day for three days. By that time both had mastered the trick equally well. The first day's procedure was to push the dog or coyote down and roll him over, saying "Roll over" several times before and during the process. The reward was a juicy piece of

beef. By the end of the second day we needed only to tap the front leg on one side, making a circular motion and saying "Roll over" to have both do it. At the end of the third day all that was needed was to make a circle with the hand, show the meat, and say "Roll over." The fourth day each rolled over by word and motion alone. After several days this trick was neglected. At monthly intervals we would spring it on them again. The first such performance after a recess required moving the hand in a circle and tapping the leg. The coyote required a tap on the second trial, but at the end of the five trials both did



REDDY AT A TENDER SIX MONTHS

A playful and charming little wild pup, at the moment hiding coyly in the garden

equally well. Shaking hands was a trick also easily learned.

Reddy would slink away and even snarl when one approached him garbed in boots and jeans. The reason for this queer reaction, dating from the tenth month of the coyote's life, became known to us only after Reddy's spirit had passed on. In a downtown hardware store we learned that a lineman so dressed had mistaken Reddy's collie-like welcoming for an attack and had kicked the coyote. Reddy never forgot.

Reddy loved to ride in the car, but had the disagreeable habit of nipping one's ears at the wrong time. He howled at about six months, and after his eighth month, he could put on a concert by himself. His chief diversion seemed to be that of echoing each train whistle with a prolonged howl, especially one train whose whistle was quite shrill. Play was second only to eating. He could cut a barley sack into shreds within a minute. Crumpling and tearing paper was fun. Running and leaping from me or grasping my arm and shoulder was sheer merriment for Reddy. He did not mind who played with him. Upon several occasions he had been chained to a table at the Normal or allowed to roam at will in the biology room. At such times he was a constant source of amusement to the students. His fondness for bright-colored clothing caused many an embarrassing moment. Pens, pencils, paper, even books, when within reach, were great toys and were soon rendered useless. Rubber tubing, key ring cases and leather straps were choice playthings. His teeth were sharp, and cleaving was his art. Reddy's sec-

ond teeth, which he got during his fifth and sixth months, were more sturdy but not any sharper than his baby teeth. These latter teeth were literally pushed to one side, but were functional until the new ones were more than half-way out. We were ever on guard to prevent accidents, but Reddy never bit anyone. Given the opportunity, he licked our youngster's hands through the netting of his pen. Reddy and children were mutual friends; one as anxious as the other to be recognized or petted.

Circumstances, mostly legal, and other minor factors made it imperative that Reddy be dispensed with, and all too soon for me, the time for parting came. He was at that time a year old. Reddy paid a last visit to the school population of our town. At each building he was displayed, discussed and fondled by teachers and children.

Now Reddy is dead. He lived not in vain. His one year in LaGrande proved him to be quite mischievous, intelligent and dog-like. He was not always confined to his cage, and he knew nothing but kindness. He was never a killer; he did not have the chance. In Nature this is the coyote's occupation. The weak and diseased are his main prey, although outlaws of his family slay domestic animals. There is no better rodent controller! Reddy did have an odor, like any other animal. We never considered him dangerous. He never snapped.

If the children of our city had been the jury, Reddy would have won his case. Tomorrow, under circumstances similar to Reddy's, they will be. Then we can hope for a plan of control rather than of extermination.

A Trailing Clematis

By ETHEL MARY BAKER

OFTEN, the gentle hand of Nature far surpasses in artistic beauty the cruder efforts of man. We thought we were seeing things that day when we first glimpsed the lovely, fragile-looking *Clematis occidentalis* draped over a small spruce tree. Man would have trained it up a wire, or perhaps tied it to a clumsy wooden trellis, but Nature urged those twisting, creeping stems upward, interlacing them among the sturdy shoots and friendly nee-

dles of the spruce, until they finally reached the top, only to go cadencing again, trailing a shower of silvery-blue stars like ripples of music, behind them, all against a background of living green.

At first glance, the blossom of this dainty wildling, both in form and color of bloom, much resembles our



native blue columbine, *Aquilegia coerulea*, but upon closer inspection, it is at once revealed as a clematis, although both belong to the same family. A habitant of the higher altitudes, this clematis is naturally partial to the shade of spruce and pine, reveling in the cushiony soil about their feet, but it can be successfully transplanted to the garden providing some of its native soil is transported with it. In fact, specimens in our garden that are given some shade, plenty

of leafmold, and watered generously, seem quite as happy there as in their mountain home. It does not grow tall, usually not more than seven feet, nor will it cover unsightly objects with a mass of foliage. Nevertheless, it's charming enough to live up to its common name—Virgin's Bower.

THE FLOWERING STONES OF KARROO

Strange flowers of the Dark Continent

By ALLEN H. WOOD, JR.

AFRICA—huge, harsh, intriguing—mother of pygmy, behemoth and plant life that brook no competition from the rest of the world. Much of its flora is the epitome of grace and colorful beauty, yet certain of the plant groups native to the Dark Continent are inexplicably grotesque and misshapen—to a degree, even, that leads one to wonder if they are not, perhaps, representatives from another planet. The strangest forms are probably found in the Mesembryanthema. Their scientific names are in keeping with their uncouth shapes—*Bijlia*, *Braunsia*, *Conophytum*, *Dactyloopsis*, *Gibbaeum*, *Lithops*, *Pleiospilos*, and many others of unique euphony. Two genera, *Lithops* and *Pleiospilos*, will be discussed, as species of both are available in the United States for those who may wish to grow a few of these weird immigrants.

As the sun brushes past the tip of South Africa, it may look down upon an extensive hilly and stony desert that sweeps in a great scimitar south and east from Great Namaqualand. This arid section, which enjoys no rain from eight to fifteen months at a stretch, is known as the Great and Little Karroo. Here it is that most of the Flowering Stones grow—strange, sea-anemone-like succulents partly buried in the ground among areas of gravelly quartzite, granite, limestone, or yellowish sand. These fissured plants are small, and most of the various genera represented in the Karroo have many characteristics in common.

In order to grow in a region of such extreme aridity, plants must be peculiarly constructed to absorb and retain moisture as long as possible, and to avoid excessive evaporation. Nature has seen to it that these small Karroo succulents are perfectly adapted to meet the harsh circumstances under which they exist. *Lithops pseudotruncatella*, which is about as well known as any of this group, has a pair of thick fleshy leaves grown together into a spherical body, the division between the leaves being indicated only by a narrow central fissure. Such an arrangement provides the smallest possible evaporating surface with the greatest content.

Plants of this genus are also buried in sand or gravel to the tops of their leaves. The leaves, furthermore, have hyaline or semi-transparent spots on the above-ground parts that admit the sun in reduced strength to the interior of the plant where the chlorophyll or growing layer



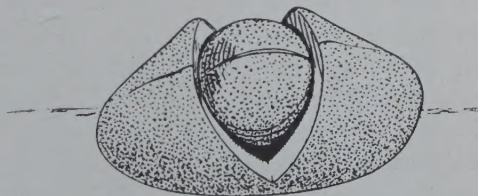
A "STONE" BLOOMS

Lithops pseudotruncatella is one of the interesting flowering stones of Africa

is located. Most plants, of course, have this breathing layer on the outside. One might almost say that this species had been turned inside out by the genes of evolution as a protection against too powerful sun rays! The young growths are guarded against excessive dryness and heat by forming and developing within the old plant beneath the vegetative window panes. When they have become strong enough to withstand the drought and glare of their habitat, they gradually replace the parent plant, which remains as a parchment-like skin covering until the first winter rain causes the new growth to swell and burst through it. Buds also develop within the cavity; the rayed white or yellow flowers open soon after the new growth has supplanted the old. Thus the life cycle of *Lithops* is one that is marvelously adapted to unusually difficult growing conditions.

Yet this is not all! One of the very few examples of perfect plant mimicry is exemplified by these succulents. Mimicry among animals, birds, and insects is quite com-

mon; it is a rarity, however, in plant life. It seems that ostriches and monkeys, as well as antelopes and goats, have a fondness for the palatable pulp of these Mesembryanthema. Without some means of protection they would have been extirpated long ago. Whether on account of these depredations by animals and birds, or for some other reason,



IT HARDLY LOOKS LIKE A PLANT

Yet this is *Pleiospilos nelii*, another of the stone-like plants of dry Africa

Karoo succulents have developed a form of imitation unparalleled in the history of botany.

More than one hundred years ago, an explorer named Burchell wrote concerning a species of *Lithops*: "On picking up from the stony ground what was supposed a curiously shaped pebble, it proved to be a plant, and an additional new species to the numerous tribe of Mesembryanthemum, but in color and appearance bore the closest resemblance to the stones between which it was growing. On the same ground was found a species of the *Gryllus* tribe amongst the stones, and so exactly like them in color and even in shape, that it could never have been discovered, had it not been observed just at a moment when in motion."

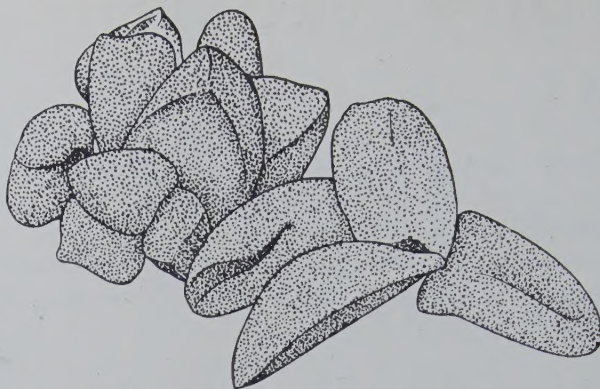
That is the secret of the extraordinary imitative faculty

exhibited by numerous Karroo genera, the most striking examples occurring in *Conophytum*, *Gibbaeum*, *Lithops*, *Pleiospilos*, and *Rimaria*. The tops of their leaves and shape in general resemble the stones and gravel among which they grow. Not any kind of stones, mind you, but the particular type that exists where each species is native. *Lithops* growing among splinters of limestone is white, with brownish streaks that resemble natural weathering. *Lithops* in gray shale is gray, and in brown shale, brown! Plants even assume the finishing touch of lining or marbling to make the mimicry perfect.

Numerous explorers have written at length about the difficulty experienced in collecting specimens of these plants; not because the plants were rare, but on account of the attendant hardship in isolating them from their pebbly background. It is only at flowering time that these succulents are distinguishable; then they are quite conspicuous.

Dr. Marloth gives an interesting description of a flowering stone, *Didymaotus lapidiformis*, which has extended itself to mimic two kinds of stones that invariably occur in its restricted range.

"This in many respects so remarkable plant is known only from the Bokkeveld Karroo, where it occurs a few miles north and north-east of Karroopoort, on the road from Ceres and Calvinia. Its habitat is restricted to bare plains covered with fragments of two kinds of stone, a rust-colored and a slate-colored shale. The fragments, which are all of a more or less angular shape, form in some of these fields a level surface, as if a street-roller had passed over them. On such patches only, which are frequently devoid of all, or nearly all other vegetation, *D. lapidiformis* is to be found. Usually the plant consists of two pairs of leaves, a larger and more angular old pair (of the previous year) and a young pair, appearing



TWO MORE ODD SPECIES OF PLEIOSPILOS

These plants have developed a protective formation imitating the stones around them

species all have their interesting imitative points, from spheroid shapes covered with soft white hair to gnarled, angular forms that resemble broken and weather-beaten rocks.

Perhaps you would like to acquire a few plants of *Lithops*, or *Pleiospilos*, which resembles *Lithops* in many ways. Both seeds and growing plants of several species are available in the United States. They may be grown as house or greenhouse plants providing they are placed where the maximum amount of sun reaches them. Their culture is not difficult, and their presence is perennially interesting.

In order to maintain the plants with their natural hardness and typical color, they should not be planted in manured or too rich soil. Soil composed of one-third leaf mold, one-third clay, and one-third sand, with the addition of some fine gravel well suits them. Little water is needed, and should be given in the morning or evening, with care not to wet the plant itself, as specimens on which water is allowed to stand often become afflicted with a rot. Species of *Lithops* and *Pleiospilos* may be raised from seed, and mature plants increased from cuttings.

A collection of unusual Mesembryanthema is still quite a rarity in this country; it must be due to the general lack of knowledge that such remarkable plants even exist, for once a collection is started, its owner soon becomes a rabid enthusiast.

We have received a number of inquiries from teachers and others asking whether extra copies of our Rotogravure Section could be obtained separate from the magazine. Most of these teachers wanted the extras for mounting, posting, scrapbook, or other class projects.

Owing to certain mechanical considerations in connection with printing the magazine, we have on hand some extras of the Rotogravure Sections from October, 1934, to September, 1935, inclusive. These are untrimmed and admirable for the above-mentioned purposes. The task of collating these, and the cost of mailing them, have made us hesitate about announcing their availability. However, there appears to be a definite demand and use for them.

Therefore we are making available complete, unbound and untrimmed sets of the first twelve months (192 pages of Nature pictures) of the Rotogravure Section at one dollar a set, or the first or last six months (Oct., 1934, to Feb., 1935, or March, 1935, to Sept., 1935) at fifty cents a set. Extras of one particular month are available at ten cents each as long as they last and provided at least ten extras from any one month are ordered at one time. In the event that one or two months of 1934-1935 become exhausted it may be necessary to substitute separates of October and November of 1935 to complete the twelve issues.

FISHES, BEWARE THE FUNGUS!

By MYRON GORDON

Zoological Laboratory, Cornell University

WHEN a fish attacks a plant that is no news; but when a plant attacks a living fish that *is* news.

It's news to you, indeed, when you step up to your aquarium and find your favorite fish supporting a strange fuzzy white growth on parts of its anatomy. It's news, bad news, when that favorite fish of yours shows symptoms of distress, twitching helplessly under a forest of fuzz, swimming sluggishly, stupidly, uninterested at your approach. When it refuses food you know something is wrong. The fish is not acting as if it were old to match its disguise of long white hair, it is old in spirit, and definitely poor in health. The fish is being attacked by a plant fiend, a predacious water mold, a degenerate alga-like fungus, *Saprolegnia*.

The fuzzy white hair-like filaments of *Saprolegnia* are its branches, its trunk and its reproductive organs. These all-purpose filaments, and *Saprolegnia* is nothing more than a cultivated field of such filaments, attack the body of the fish, secrete enzymes to dissolve its tissues, absorb the body fluids, and then by an ingenious series of processes transform themselves into thousands of embryo *Saprolegnia* that go forth to make life miserable for thousands of new fish victims.

Man as well as the beasts, fish and fowl are victims of fungus infections. "Barber's itch", or ringworm, is caused

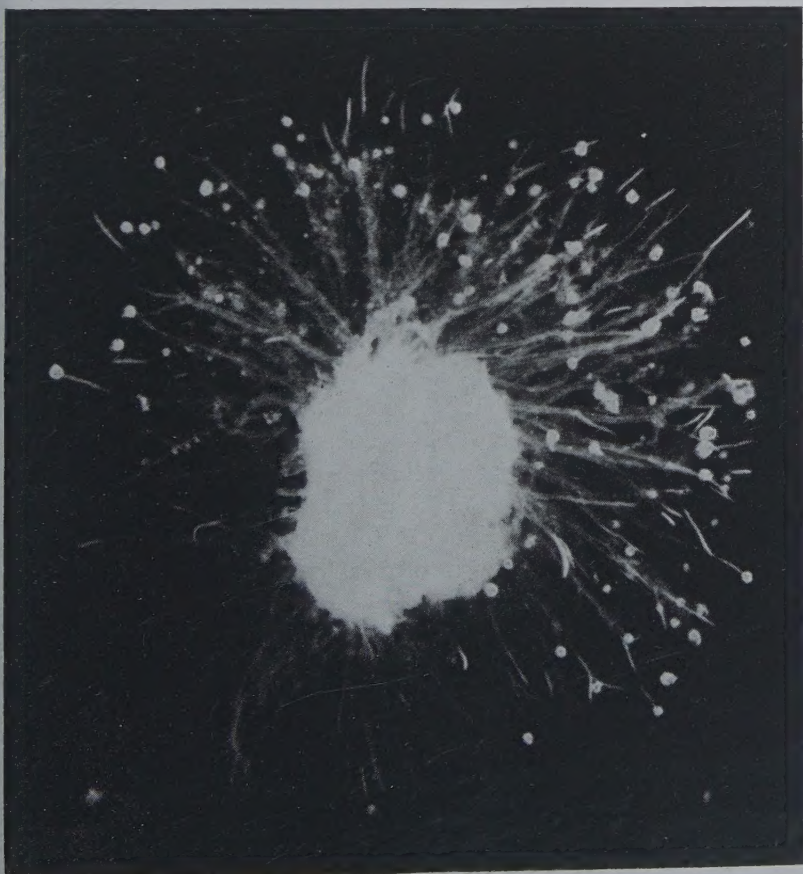
by a fungus, *Trichophyton*. "Athlete's foot", the patent medicine trade's best friend, is set on foot by another fungus invader of human flesh. Swine are subject to a breadmold-like disease, *mucormycosis*, which is brought about by a close relative of *Saprolegnia*. And birds have their fungus enemies which invade their combs, wattles and other unfeathered portions of their heads; the disease is called avian *favus*.

Most fish are immune to the attacks of the fungus *Saprolegnia* because they are healthy. The healthy skin of a fish is an efficient manufacturing plant of *Saprolegnia* eradicators. When the health of the fish is impaired in any way, the fish's efficiency in manufacturing "Saprolegnia-Flit" is lowered. The spores of the fungus penetrate the fish's skin fortress and start their fuzzy growth.

Sometimes fungus spores have an open door through which they enter and then attack the vital parts of the fish. If other disease organisms should first gain access to the fish and break down the fish's first line of its defense in its great skin wall, all the *Saprolegnia* has to do is to march in and set up its own barbarous system of torture. The fungus spores wait for every opportunity. If a fish should bump its head and split the film of protection, which is its skin, the fungus spores will be there to take advantage of the break.

If two fish have had an argument and one or the other or both have torn open sores, the fungus spores will be there and enter through these portals. The fungus spores were there before the fight. They had ringside seats. They always win after a fight. They are scavengers which do not have the decency to wait for their victims to die. They start to destroy them at the slightest opportunity.

And to think that the closest relatives of the *Saprolegnia* are the filamentous green algæ—the green kind of algæ that you see growing harmlessly, forming green felt-like mats, on moist flowerpots and wet areas in greenhouses. But *Saprolegnia* is a renegade alga. It has turned away from rugged individualism in the business of making



PHOTOMICROGRAPH OF THE FUNGUS, *SAPROLEGNIA*, AND THE LAST BIT OF WHAT ONCE WAS A PLATYFISH

Note that some of the filaments have nodules at their tips while others are free of these balls and are merely slightly swollen

its own food. It has degenerated into a colorless, predacious, marauding, low-living plant villain that attacks the helpless, the weak, the sick, and the dying.

The worst villains are efficient villains. *Saprolegnia* has found many short cuts to success. The members of the *Saprolegnia* tribe have a choice of the asexual, the hermaphroditic and the parthenogenetic methods of reproduction. Suppose a few *Saprolegnia* spores should pounce upon an unfortunate victim, such as your unfortunate fish. If the spores are successful in gaining access to the flesh of their victim, they soon send out branches called hyphæ. Many branches are rapidly developed. These hyphæ are the whitish filaments that you see on an infected fish. To a botanist many hyphæ are known, collectively, as a mycelium, but to a fish keeper they are just plain fungus. As *Saprolegnia* gets under way, the white filaments or hyphæ develop, at their tips, special messengers of ill will in the form of spores, zoospores to be exact. These tiny potential torturers are built like torpedoes, for they carry their own propellers in the form of a pair of whip-like oars. They go scooting around searching for fresh victims. This, in brief, is the asexual method of reproduction that *Saprolegnia* employs.

As a device for quickly multiplying their number of life-sucking tentacles, after once gaining access to a sick fish, the tips of certain of the fungus filaments develop into egg manufacturing organs. The tips of the filaments become enlarged, round egg receptacles; botanists call them oogonia. And very conveniently, on the same filament, close to the egg receptacles, sperm manufacturing organs are developed, botanically known as antheridia. When these two sexual organs mature, the sperm carrying branches reach over, penetrate the egg receptacles and the liberated sperms fertilize the eggs. This is the sexual and at the same time hermaphroditic method of reproduction. As a result, thousands of young *Saprolegnia* oöspores frisk into action, send out their tiny hyphæ and dig in for the good of the *Saprolegnia* cause.

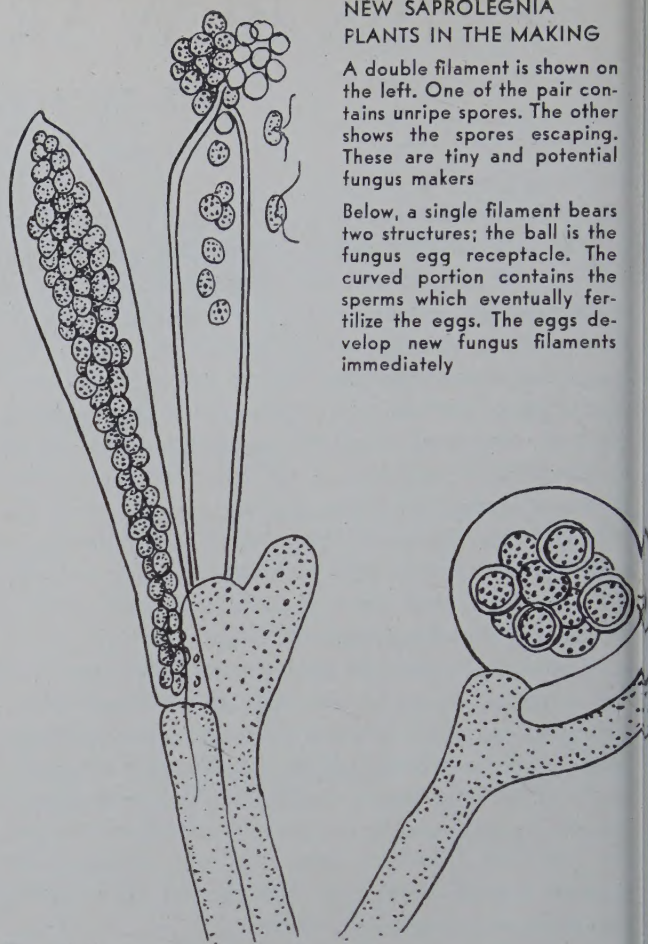
The male members of some *Saprolegnia* family "hyphæ trees" refuse to do their share and fertilize the family eggs. This does not prevent the fungus eggs from hatching. The eggs, unfertilized as they are, hatch anyway and they carry on in typical *Saprolegnia* fashion. The development of new individuals from unfertilized eggs is parthenogenesis. It is just another method of reproduction to these versatile *Saprolegnia*es.

Once fungus gains access to a fish, that unlucky member is eventually led out of its aquatic world—unless the hand of man comes to the rescue—in time. The treatment is simple and most writers on aquarium fishes are

NEW SAPROLEGNIA PLANTS IN THE MAKING

A double filament is shown on the left. One of the pair contains unripe spores. The other shows the spores escaping. These are tiny and potential fungus makers

Below, a single filament bears two structures; the ball is the fungus egg receptacle. The curved portion contains the sperms which eventually fertilize the eggs. The eggs develop new fungus filaments immediately



agreed (Coates, Stoye, Peters, Innes, Mann) that a teaspoonful of sea salt to a gallon of water, at 80°F., will check the fungus growth if the growth is of recent origin. If one teaspoonful of salt per gallon is not sufficient, after a day's treatment, try a tablespoonful for a few minutes, and then place the fish back into the weaker solution until the fungus is checked. Recovery depends upon the ability of the fish to mend its broken film of healthy skin so that it may combat future invasions of fungus spores by secreting fungus repellents from its repellent-manufacturing establishment in its fortress of skin.

If man's aid is of no avail, *Saprolegnia* grows and forms a fluffy, dirty-white excrescence, an unlovely funereal bouquet, a morbid floral design in anticipation of the death of its victim. Unlike most parasites, *Saprolegnia*'s work is not complete until nothing remains of its victim. It is both a parasite and a saprophyte. It turns the living and the dead into *Saprolegnia*, which in turn invokes its multiple powers to create more, and more, and more.

As it properly should, Spring rules in the April issue of Nature Magazine. Edmund J. Sawyer, naturalist and artist, takes us with him on a Nature sketching trip and introduces us to the wealth of the bursting season. Julian Corrington writes of the frog; Louise Gleason of that outstanding flower of the season, the hepatica; Adolph Kruhm makes herbs a fascinating subject. Linking the waning season with the new, Louis Linn writes a delightfully fascinating story of a winter wren.

"GILA"

A pet present-day "monster"

GUY VAN DUYN

GRAVITY HELPS GILA TO SWALLOW HIS EGG

Often he would hold his head back this way when eating. The camera also records the nictitating membrane, or "third eyelid" in action.



"GILA" came to Florida in an express package, the gift of a fellow naturalist who lives in Arizona and with whom I had tramped the enchanting cactus-clad hills in futile quest of just such a specimen. Perhaps I was a jinx, for Jim had said they weren't rare and, to prove it, had run across this one soon after my departure.

Perhaps the Gila monster is too well known to warrant more than the briefest description. The photographs accurately portray its bulky, ungraceful form, powerful head and short, fat tail. The latter, incidentally, serves as a reservoir for surplus nourishment, stored up against a winter season when food is unavailable and when the lizard probably hibernates.

The coloration, however, is unique and attractive, the lighter parts being a pale coral pink, with perhaps a hint of orange, contrasting sharply with the dark markings, which are nearly black. The arrangement of colors, while irregular and varying with the individual specimen, produces a nicely balanced pattern that, accentuated by the peculiar bead-like formation of the scales, is strikingly suggestive of Indian beadwork.

The reptile is scientifically classified in a genus appro-

priately called *Heloderma*, or beaded lizards, of which only two species are known: The Gila monster, *Heloderma suspectum*, of southern Arizona, New Mexico and northern Mexico, and the Mexican beaded lizard, *H. horridum*, a larger species of somewhat different form and coloration, which seems to be confined to central and southern portions of Mexico. This genus alone, strange to say, embraces all the known poisonous lizards, both species being possessed of grooved, venom-conducting fangs.

Not a particularly large specimen, Gila measures eighteen inches over all and weighs about two pounds. During the eighteen months that he has been in my care, he has grown but a scant half inch and gained a few ounces. Like other lizards he sheds his skin two or three times a year. Not a one-piece job, as with snakes, however. Gila's skin peels off in sections during a period of two or more weeks.

When first received, Gila had a full set of ten sharp, curved claws, but all these have been pulled out by his industrious digging, a condition noted in many large captive lizards, and are now in varying stages of regrowth.

His "toes" as well as "fingers" are remarkable for their flexibility, seemingly doubling forward or back with utter disregard to structural limitations ordinarily imposed upon such members. Nor is the heavy body so unyielding as might be supposed, as I learned one day when I discovered Gila in the act of crawling out of a wire basket under which he had been temporarily confined. He was already halfway through and the small



AN EGG EVERY FIVE OR SIX DAYS FOR GILA

This diet kept him plump and in excellent health; more frequent feeding resulting in gastric disturbances

size of the mesh imposed such a stricture amidships of his fat body as to make it actually appear like two parts. While I pondered how best to extricate him, he nonchalantly oozed through and, folding the hind legs closely against the tail, completed the passage without the least apparent discomfort.

While his sight seems adequate, Gila's large, well-developed ear openings seem of little or no use, there being no visible reaction to sound of any kind. The flat, forked tongue, on the contrary, is a highly developed sensory organ, serving the closely allied senses of taste and scent, probably also interpreting sound vibrations. It meticulously investigates objects encountered along his path when he is traveling.

His gait, even at top speed, is not a fast one, being at best a purposeful waddle. The puny legs are actually able to sustain his body in a real emergency, only the chubby tail dragging and swinging from side to side in approved lizard style, though obviously lacking in propulsive power. In fact, it is a decided impediment to progress.

Unlike most reptile pets, Gila offers no problem in the matter of food, his sole item of diet being a readily procurable commodity—eggs. Usually I break the egg and serve it in a dish, but occasionally I hold it lengthwise between thumb and forefinger, letting him crush it in his powerful jaws, whereupon he laps up the contents with his long tongue. His swallowing apparatus appears somewhat inefficient, for at intervals he takes time out from his lapping and points his blunt nose skyward, invoking the aid of gravity in the seemingly laborious process of downing a mouthful. Economically, Gila is a sound proposition, an egg every five or six days sufficing to keep him in a plump and well-fed condition. More frequent feeding, I found, was apt to induce gastric disturbances resulting in subsequent rejection of the meal. Under natural conditions perhaps his meals were even less frequent than at present, although possibly more substantial individually, for I doubt that Gila would ever lose interest in a nestful of eggs while any edible contents remained. Probably the nests most frequently raided are those of other reptiles, although ground-nesting birds also doubtless pay tribute in season.

Kept in a room of ordinary temperature, Gila spurned food for a period of about three months during the winter, lapping a little water on a few occasions. On cool nights he evinced a desire to burrow, scratching the floor in a slow methodical manner until removed to a warmer spot. During this period of almost constant sleep he would occasionally roll over and lie for a time flat on his back—a most incongruous attitude for a reptile. An

occasional soul-satisfying yawn is another of his startling accomplishments—a manifestation that I had heretofore associated only with higher animal forms.

Another peculiarity, unexpected of a dweller in arid country, is Gila's fondness for moisture. In summer he spends much of the time lying in his drinking water, in obvious preference to dry territory. If Florida's moderate summer weather "drives him to drink", one wonders how he ever endured the unmerciful heat of the Gila River country where we encountered temperatures of 120 in the shade—if we could find any—and even the case-

hardened natives complained that it was "hotter'n a six-shooter".

Gila is inclined to be a docile creature and may ordinarily be handled or picked up without displaying more than a mild interest in the matter. Sometimes, during late afternoon or early evening, however, when he is inclined to be more active, he may become alarmed or annoyed and threaten an intruder by puffing and blowing. On a few occasions,

mostly when he had been permitted to wander around in considerable liberty, he has temporarily become actually vicious, hissing explosively and, with commendable agility, throwing himself around to face the intruder with jaws menacingly open. But the mood was easily dispelled by picking him up, when he quickly reverted to his customary docility.

There seems to have been considerable controversy in the past as to the venomous quality of the Gila monster's bite, but most authorities now rate it as dangerous to man. Aside from the potency of the venom, however, a bite would doubtless prove decidedly unpleasant, for the powerful jaws have a habit of retaining a tenacious grip on anything seized.

The venom-conducting fangs are—quite contrary to orthodox arrangement—situated in the *lower* jaw. My Gila possesses four such fangs, two on each side, near the front of the jaw. They are small, in fact so short as to be barely visible to the naked eye when the dusky mouth is opened; but they leave minute, telltale perforations in paper or leather, when he can be induced to seize such an object. There are, however, teeth in the upper jaw as well—at least three on each side—and larger ones, moreover, than those below. Whether these, too, might be true fangs I have as yet made no effort to determine; available books mention those in the lower jaw only.

A most perplexing question, to me, is why the beaded lizards, alone among the lizards of the world, should have developed this poison equipment. Certainly they have no need of it to secure such food as they seem to prefer in their present habitat and mode of life.



HE ENJOYS BEING HELD

Even when in belligerent mood, he will calm down most docilely when he is picked up

Flower Cinderellas

By ADOLPH KRUHM

THE task of finding the foot to fit the dainty slipper of fairy tale was a simple one compared with that confronting the gardener in choosing royalty from among the annuals. How can we best select, from among scores of good kinds in hundreds of fine varieties, the ones that best serve the home gardener's needs?

The seeds of most annuals germinate readily and grow quickly into sturdy plants, blooming freely. But, as the season advances, somehow the gardener's wishes and hopes seem far from being realized. Why? Perhaps expectations ran too high or personal preferences as to color, habit of growth, or season of blooming were not given sufficient consideration. Seeds, soil, sunshine and moisture sometimes prove fickle factors, of course. But, after all, to get what you want, the first step is to analyze clearly your own desires.

First we should recognize two broad divisions in annuals—those which best serve as cut flowers, and those wanted for show in the garden. Comparatively few annuals fill both needs equally well. The ones that do, we may finally consider in class one. Of course there will be



PHOTOGRAPHS COURTESY OF BODGER SEEDS, LTD.

ZINNIAS ARE GIVEN FRONT RANK AMONG ANNUALS

The author confesses that these are his favorites and only laments that they lack fragrance. Here we have Early Wonder Gypsy, an early-bloomer with a dwarf habit



THERE IS VARIETY AMONG THE ZINNIAS

Not only do they differ widely in height, size and color, but we find new departures—such as the scabiose-flowered zinnia

arguments on the merits of this or that annual as long as many kinds of climatic and soil conditions confront gardeners. But to be worthy of belonging in class one a flower should have five outstanding characteristics. The flowers must have long and substantial stems; they should make a good showing in the garden and last well, both outdoors and after cutting; they should come in a wide range of colors to fit decorative schemes; they should offer a variety of shapes, sizes and, if possible, be fragrant. It is really amazing how few among the hundreds of available annuals measure up to this critical standard.

Sweet peas head class one in spite of the fact that, in many parts of the country, it is a specialist's job to grow them to perfection. Endowed by Nature with delightful fragrance; colors defying the rainbow; long stiff stems, if grown well, and a fair degree of lasting qualities after being brought indoors, they represent well-nigh the ideal annual. No wonder our home gardeners annually use tons of sweet pea seeds, and Europe buys additional tons from us. This quantity production causes them to be cheap, and there is no reason why even the humblest garden should not hold plenty of them.

American plant breeders are doing their utmost to have the sweet pea reach still higher pinnacles of perfection. Of course, ever increasing size is noticeable in all the latest varieties of the wavy Spencer type, of which the summer-flowering Chinese Blue is the latest achievement. Early flowering is a much-coveted goal. And we are rapidly approaching it with exquisite, extra early Shirley

Temple. It will be difficult indeed to surpass this dainty little lady, with its frilled, pink frocks and fluted form reminiscent of the dimpled smile of that astonishing youngster whose name this sweet pea bears.

The one shortcoming of sweet peas are their, as yet, comparatively short season of blooming. Our personal choice as the highest ranking, all-purpose annual does not have this fault, and if it only could give us a whiff of even slight fragrance! Lack of it causes the zinnia—yes, that is our favorite—to fall short of being the ideal summer flower. But it carries compensation in its long blooming season; lasting quality after cutting; the sturdy bushy character of its plants, while a liberal assortment of colors are augmented by several new and unusual shapes.

Truly, here is a flower deserving great appreciation by millionaire and suburbanite alike. Those looking for size and striking colors will find both in the *Grandiflora* and *dahlia*-flowered types. If in search for the dainty table decorations, the pompon and early wonder strains, of which burnt-orange-colored "Gipsy" is the most fascinating, fill the bill to perfection. If inclined to modernistic shapes, the bizarre phantasia type brings many pastel shades. Or you can go right back to Puritan days of stiff collars, and find them in the *scabiosa*-flowered zinnia, bringing us shades of reds, pinks, orange and yellow.

Asters stand for our third choice among the highest ranking annuals. It really is difficult to decide whether they should not be classed second. But asters are just a little fussier, especially about soil conditions. They are also subject to more plant ailments, although the gradual perfecting of wilt-resisting strains helps the entire family. Asters also bring us an unusual variety of shapes, a long blooming season, and combinations of color in even one and the same flower mark a quarter century of evolution. Of course old *Queen of the Market* still holds sway as the earliest of all. As far as size, choice of colors and general make-up of its flowers are concerned it is relegated to the background by such stars of first magnitude as the mammoth peony-flowered, California giants and the *Crego* types. Among the smaller flowering varieties we encounter daintier shapes.

The prize for size goes, perhaps, to the super-giant "El Monte," of Bodger fame. A huge fellow of bold

crimson color, it proves a worthy companion to *Los Angeles*, a delicate shell pink. The range of colors found in most classes of asters satisfied popular demand for generations. The arrival of sunshine asters complicated the choice by mixing straight colors with contrasting colors. Moreover, in some instances the center petals were changed into quills, and hybridizers encouraged these unique combinations. Sunshine asters come with light blue outer petals around an amber center, others send forth soft orange moon-beams over snow-white fringes.

The latest—*Alpen-Glow*, with pale purple guard petals, a wreath of rose-purple quills and a primrose center—will cause the reader to wonder, what next?

We also consider *mari-golds* and *snapdragons* as worthy of a place in class one. "Guinea Gold" *mari-gold* still rules the realm although "Dixie Sunshine" adds a curly mum effect to the ball-shaped flowers. It still has to prove its hardiness north of the Mason and Dixon Line.

Snapdragons are bound to be grown more freely in our future gardens, due to the welcome arrival of rust-proof strains. They are easily grown and available in several distinct classes of different height, fitting them for dwarf borders and for beds. The newer still taller varieties readily develop twelve- to fourteen-inch flower spikes such as, until recently, only florists



COSMOS IS IN CLASS TWO, BUT HAS ITS POINTS

Orange Flare is an attractive species, blooming from the middle of July into the last part of October

could grow. Loveliness, a novelty in this class, with its spikes a foot long, and individual rose-pink giant flowers, will be appreciated by all those who look for material of great beauty for flower arrangements. Those preferring bolder colors will find them in nearly all classes. Striking color combinations in the same flower have been perfected, such as rose and gold, amber and pink, terra-cotta pink, yellow. These color harmonies predominate in the semi-tall varieties, affording opportunities to create unique effects in the garden border.

And now a few words about the essential factors in our class two—those faithful annuals, ready to serve either in the border or as a cut flower. Foremost among the dwarf bedding kind we count *petunias*. Many unique characteristics cause them to be indispensable for dwarf beds. *Petunias* are quite hardy. They self-seed freely, especially the old singles of the "Howard Star" type. They continue to bloom even after frost plays havoc with more tender fellows, such as *nasturtiums*. (Continued on page 183)

A Woodland Racketeer

By COLEENA COOPER

UNDER the madrones on dry ridges of the Pacific Coast Range in May or June, red-brown spikes push through the leaves, looking like sugar-pine cones stuck in the ground. At first the scales are tightly closed, later they curl back to show tiny flowerlets under a brown, hooded corolla.

Stumbling on a colony of these plants, you wonder what they are and why you have never seen them under other madrones. These shy strangers belong to the sinister tribe of the broom-raphes, floral gangsters of the worst type—true parasites.

All life must feed on other life; animals on plants and others of their kind; insects on living plants; plants themselves on loam rich in decay of organic substances. One plant, dying, enriches the soil for the next; rootlets feed greedily on the dead insects and animals in the soil.

But such plants are honest workmen compared to that group of floral vampires, the broom-raphes, thieving growths totally lacking the essential leaf-green (chlorophyll) through which hardworking plants wrest their food from earth and air. Like the human racketeer, these villains fasten themselves on some vigorous host plant and absorb from its roots or stem the food they are unable to obtain for themselves, eventually killing their host by a constant demand on its chlorophyll factory. Instead of green, they flaunt reds, oranges, browns, pale yellows and sickly whites as badges of their shady characters.

The red-brown plant you have just stumbled on under the madrones is one of the most interesting of this furtive band of juice suckers and has a name—*Boschniakia strobilacea*—that is a compound of Russian and Latin. This name was bestowed on our woodland racketeer in compliment to one Boschniaki, a Russian botanist whose name, otherwise little known in this country, is certainly unhandy for the wild flower lover. The specific name, "shaped like a pine cone", well describes this member

of the notorious Broom-rape family, Orobanchaceae.

In Sonoma County, California, where the plant is found infrequently on dry slopes under manzanita or madrone, it is commonly referred to as "that pine cone plant", since the botanical name baffles most tongues.

The manzanita and madrone are the involuntary hosts of this vegetable parasite. The dark, reddish brown cones push through the ground, scales tightly folded, from one to thirteen in a clump from a single root. When full

growth—from two to twelve inches—is reached, the scales open, showing a beautifully formed tiny yellowish flower with an odd hooded corolla of brown. Each flower contains hundreds of seeds in a "shuck" which bursts when ripe, scattering the seeds in all directions. The plant's only leaves are pale yellow scales at the base of the stalk. These often remain underground. As they contain no chlorophyll they merely loaf on the stalk until it dies.

This odd and rather conspicuous plant is rare, although its range extends from the higher coast ridges of the Santa Cruz Mountains to British Columbia. Wherever the manzanita and the madrone grow there *Boschniakia strobilacea* may occasionally be found. As the plant seeds so freely, the forest floor under the host plants should be covered with these red-brown, scaly spikes. But, like other criminals, *Boschniakia* extends itself too much and

is completely dependent on its host. The tiny seeds are too numerous to be vigorous and they will germinate only when they make suitable contact with their chosen hosts.

When the embryo has consumed the reserve food stored in the seed, a hairlike filament extends downward, seeking in the earth for a root of the host plant. If the search is fruitless and the food reserve is used up, the seedling dies, lacking the power of nourishing itself from the surrounding earth. But if it finds a live madrone or manzanita root, it adheres to it, penetrates the skin and



"THAT PINE CONE PLANT"

Thus it is casually known by the many who prefer a common name to the imposing scientific one

starts growing, feeding contentedly on the food the green leaves in the sunshine above are sending down through the root. Hereafter little *Boschniakia* leads a happy, care-free life, pushing strong spikes up through the leaf mold and forming a round tuber about the madrone root at the point where the seedling attached itself. This tuber, which has the size and appearance of a crinkled, brown-gold ball, finally surrounds the root and kills the part away from the stem. It apparently serves as some kind of reservoir for stolen food supplies. The tuber is easily cut with a knife. The inside is creamy in color and intensely bitter.

Boschniakia now has its living secure and busies itself solely with transforming the nutriment of its host into further generations of juice robbers.

Many persons trace a resemblance in the "pine-cone plant" to the well-known rosy Sierra "snow plant"—a species also lacking leaf-green, and now referred by leading botanists to another family, the Indianpipe family, *Monotropaceae*.

Watch for this wild western bandit in May or June under the madrone trees and in manzanita chaparral—it will prove an intensely interesting acquaintance, popularly known as the "pine-cone plant."

Arctic Three-toed Woodpecker

By P. B. PEABODY

OF THE rarer woodpeckers, North America has two of the three-toed genus; the American and the Arctic, both boreal and sub-boreal in distribution. Both species have only three toes on each foot, and the males have a lemon crown. The Arctic woodpecker is resident in mid-northern Minnesota. Like all true residents, he is a hardy creature. His cheery "kip" enlivens many a sombre winter day.

The Arctic three-toed woodpecker has a decided fondness for tamarack swamps, perhaps because, in such places, fires burn fiercely and the tamarack dies. Then there are feasts for the woodpeckers. Under such circumstances, the birds flock in from surrounding regions. Such burnings, when occurring in late winter, develop semi-colonial nestings. One may not fathom the blended strength and skill with which this woodpecker chisels the intensely hard wood of tamaracks. To be sure, he much prefers heart-dead trees, which he uses cannily when he finds them. The nest-burrow openings are usually made just below a knot. They are symmetrical, tough though the wood may be. They are a bit smaller than those made by flickers, and the cavities



are not nearly so deep. The height of the nests from the ground is usually ten or twelve feet. Occasionally, they may be as low as four feet.

The eggs of this woodpecker are often only three in number. They are decidedly duller of gloss than the eggs of most woodpeckers. In contour they tend to roundness and pointedness. One spring I found a single colony of breeding three-toed woodpeckers in a burned Minnesota tamarack swamp. It was easy to locate the six or seven nests within one small area because of the shrill chatter of the young birds. I have never found it to be true of the young of this bird, as it is with the little downy, that they become suddenly silent upon human approach.

No woodpeckers are more highly useful than these. When tamaracks are fire-killed, Arctic woodpeckers fall energetically to work at once, peeling off the loosened bark. Under such circumstances, these birds are both expert and nimble. I have seen an Arctic woodpecker dart to earth, retrieving, almost before it reached ground, a large grub loosened by his thrust. So the birds wage unrelenting war on the enemies of the northern forests.



THE NATURE PICTURE OF THE MONTH
"CLOUDS" BY HANS F. CHEN, MT. VERNON, N. Y.



When he first discovered this pathway through the fallen pine needles, Dr. Ernest W. Gates of Boston thought that it was the runway of a snake, or some small mammal. However, he soon noticed that changes were being made every night and investigation by flashlight revealed a legion of black ants at work at highway construction.

This ant run extended a distance of thirty feet to the nest. One end of it was over sand where the pine needles were few. This stretch the ants cleared with two or three

nights of work. The remaining twelve feet of the run was covered with thickly-matted needles, some of them trodden down. For three weeks the ants worked at the task of clearing this part of the highway. Methodically they moved away the needles until they had cleared the right-of-way down to the ground, making a smooth turn-pike along which they could travel without the delay of climbing over obstacles. From then on they travelled speedily over this road on their nocturnal business. The photograph of the ants was taken by flashlight at night.





TARANTULA AND TARANTULA HAWK

As recorded by Lee Passmore

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Last month we recorded the picture story of the tarantula. This month we meet this spider again, this time encountering a giant wasp, *Pepsis formosa*, its most deadly enemy, commonly called the tarantula hawk.

In the first act of this tragic drama the spider is frantically trying to reach its home burrow. The way is barred by *Pepsis*. The tarantula knows that within the burrow it may better defend itself and avoid the sting of its enemy. *Pepsis*, however, has no intention of letting her

prey escape. So it must be a battle, and to the death.

Holding its body high off the ground, the spider meets its winged foe. With mandibles spread wide apart so as to use its sharp fangs the instant an opportunity offers, the spider turns to face its enemy. But the wasp is too quick. Before the tarantula can make a move in self-defense, *Pepsis*, like a flash of light, covers the short space between them, alighting beside her prey, but out of reach of the deadly fangs.





The stinger of Pepsis is thrust into the spider's body just behind the second leg. Almost immediately the tarantula's legs become limp. In a few seconds it is unable to rise. Pepsis, apparently unconcerned, stands nearby, brushing her antennae with her front legs and preening her brilliant, orange-colored wings. A convulsive shudder shakes the hairy frame of the spider. It struggles vainly to rise while Pepsis watches to make sure that her attack has been successful.



The next move of the tarantula hawk is to turn over the body of her victim. Holding one leg of the tarantula in her jaws, the wasp stings the spider several times. Any movement by the tarantula is a signal for Pepsis to insert her sting where the tarantula's leg joins the body. The effect is almost instantaneous; all motion by the spider stops. The battle has been quickly won and Pepsis is ready to use the spoils in the way she has planned.

Pepsis has now dragged the spider to the entrance of the tarantula's own home burrow. The limp and apparently lifeless body of the tarantula offers little resistance. The strength of the wasp is amazing. The average tarantula outweighs its winged enemy five to one, so not only the victory but the handling of her victim seems astounding. Yet Mr. Passmore says that he has witnessed many such encounters and has yet to see Pepsis fail to win the battle.

The day after this fight had taken place Mr. Passmore excavated the burrow chamber and found the paralyzed body of the tarantula where it had been placed by the wasp. The entrance to the chamber had been filled in with earth, leaves and other matter. It was a perfect hiding place. The burrow was closed, of course, to prevent the body of the tarantula from being disturbed while the wasp's egg was hatching and the larva of Pepsis was feeding upon it.





The paralyzed spider is seen in the position in which it was found by Mr. Passmore. The burrow also contained two old egg-sacs and the chitinous parts of numerous insects. A careful search failed to reveal the egg of the wasp.

After the larva of the wasp has eaten all of the edible parts of the tarantula it leaves the remains and crawls along the floor of the burrow to a point where it begins to build its cocoon.

The larva first spins some floss, attaching the loose material to the walls of the burrow. It then proceeds to construct its cocoon, passing the threads round and round its body, and gradually shutting itself up in the silken prison where it will transform.

Later it will cut its way out of the cocoon, then dig away the earth that fills the burrow and, finally reaching the surface, will fly away to meet and mate with one of its kind. In turn it will meet and vanquish a tarantula, carry the victim to a hole of its own making or to the tarantula's burrow if it can be found, lay an egg in the body of the spider and the cycle will go on. Soon after Pepsis has thus assured the continuance of her race she will die.





The construction of the cocoon of the tarantula hawk is interesting. The half-grown larva is shown in the position it occupies within the cocoon. That part of the inner surface next to the body of the larva is polished to a high degree of smoothness by the movements of the creature as it turns about in its chamber.

Just above the larva is a section of the top showing the polished interior of the cocoon. The exterior of this inner part of the cocoon is a soft, leather-like substance. This inner cocoon is further encased in the more loosely-woven outer part shown in the picture on the opposite page.

A young but fully developed *Pepsis formosa* is fond of ripe figs and often gorges itself with the juices of this fruit. It will often fall to the ground as though intoxicated after partaking too freely of the fig juice. Young tarantula hawks often gather in considerable numbers on the swinging boughs of pepper trees that grow close to streams or springs. They seem to be more numerous in places where colonies of tarantulas abound.

The story of the tarantula and the tarantula hawk is, then, striking proof of the wisdom of Nature in placing warring forms in her scheme of things in order that balance may be maintained.





On the first page of this section you have seen The Nature Picture of the Month, chosen for its pictorial beauty in portraying one of Nature's most beautiful pageants. On these two pages are six more pictures chosen by the judges for special award. Photographs may now be submitted for the next series of awards. The contest for the next series closes March 1, 1936.

Here we have an interesting and common little ground squirrel, one of those known in the western states as the picket pin. It was photographed in Yellowstone National Park by Les Taylor of Jardine, Montana, using a Kodak Recomar. Sergeant J. B. Guss of France Field, Cristobal, Canal Zone, is responsible for the striking profile of the iguana perfectly recorded on the film of his Graflex. Elsie E. Hansen of the United States Forest Service office in Denver, Colorado, snapped the interesting picture of the formation of Canada geese as they swam ashore to feed. She used an Ansco camera.



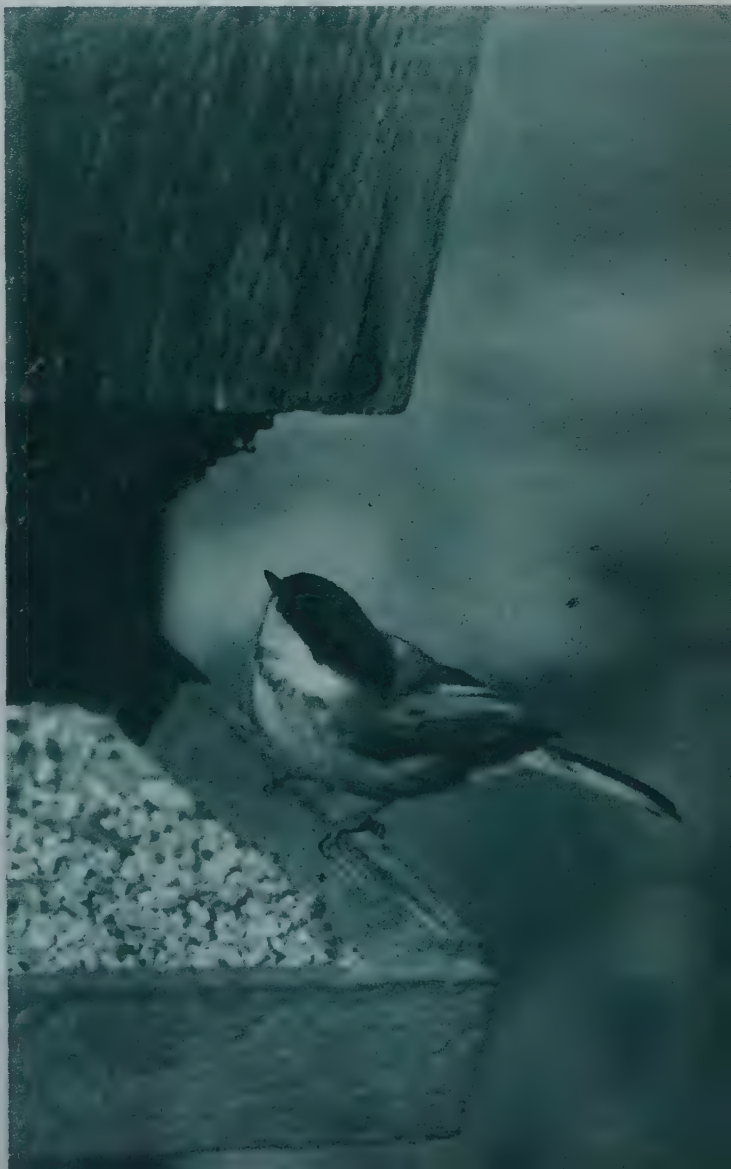
In selecting pictures worthy of award in our Rotogravure Contest we are governed by various considerations. Good photography is, of course, important. In addition, however, pictures are considered from the viewpoint of their story-telling value in a Nature sense and the difficulty and patience involved in obtaining them.

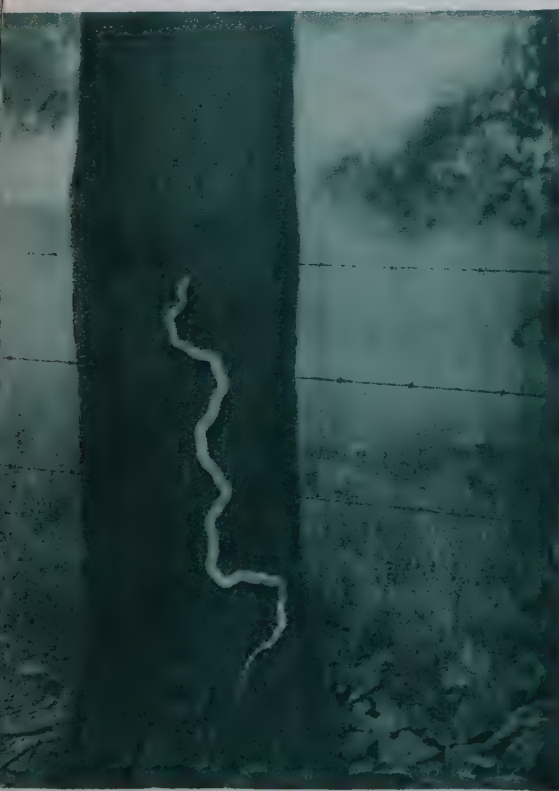
The pictures of the white-breasted nuthatch on the limb, and the black-capped chickadee at the feeding box, were both taken by L. D. Hiatt of Toledo, Ohio. They are the sort of pictures one cannot go out and take just because one feels like taking a picture. Mr. Hiatt had to get his Ica camera into the right place and then wait patiently until he could "shoot" his birds. This was ac-



complished by releasing the shutter with a thread held by the photographer.

The picture of the tree frog, *Hyla versicolor*, was taken by Percy A. Morris of Seymour, Connecticut. It has story-telling value because it vividly illustrates the protective coloration Nature has given this one of her creatures.





Here we have three interesting things in Nature, happenings that illustrate the endless fascination of the outdoors for those who have seeing eyes. Cobwebs bejeweled by dew are not uncommon sights to early risers, and an interesting exhibit is found on this rude bridge on the road to Cocoa Beach, Florida. Photograph by Helen T. Farrell.

The black snake is a common Eastern species feeding largely on rats and mice. It is known to be able to climb trees, although it is not often caught in the act. Also, it is assumed that it usually chooses to go round and round the tree. Here, however, a black snake that has just shed its coat is taking the direct road up the tree. It was caught in the act and photographed by Milton D. Walters near Kent, Ohio.

Carpenter bees of Tiffin, Ohio, have learned a new trade, and Dr. A. C. Shuman submits a photograph in evidence of the fact that they have become stone masons. These bees have bored holes and tunnels in brick. They have even gone farther and have used the brick dust from their borings to make mortar and from it have built porticoes and passages out from the surface of the brick. Observers report that they stop work promptly at six in the evening and observe rest periods during the day.





With man sending great, noisy birds to carry the mail across the Pacific, the names of many tiny spots of land in that Ocean are becoming familiar to many. Here we introduce some of the residents of these outpost isles.

The white tern lays a solitary egg, often balancing it on some rocky pinnacle or narrow ledge, or the branch of a tree. The downy chick must be hatched with a sense of equilibrium.

The red-footed booby roosts in a wild heliotrope on Wake Island, yesteryear visited only by clipper ships, now by great planes.

The lovely Laysan albatross is quite different from her sooty youngster. She is a devoted mother and has been known to sit on her nest until covered by storm-drifted sand.

On a man-hewn stone of religious significance a young frigate bird preens itself; nearby a blue-faced booby prepares to tell the intruder what it thinks.

The two young black-footed albatrosses have not yet enough strength to stand but still walk, baby-fashion, on their heels. Sooty terns are on their nests in the background.



Photographs
by Major
Chapman
Grant, under
the auspices of
the Bernice P.
Bishop Museum
of Honolulu.





Sooty terns on Wake Island are a mere remnant of the numbers found there by plume poachers who caused the greatest devastation in 1912.

Two palms and this low bush are the only vegetation of any size to be found on Laysan Island. However, the red-footed boobies make the most of this bush as a

roosting place—more than a handful of birds in a bush.

A little Laysan finch watches a male frigate bird sitting on the family eggs. In fact, if the larger bird leaves the nest the finch will puncture the egg. This picture was taken before the finches captured Laysan Island by this practice. They, and introduced rabbits, are sole rulers.





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The young Laysan albatross retains its "mara-bou boa" for some time. The sooty tern beside it is quite unafraid.

Nesting on the white beach in the blazing sun, the sooty terns spread awning-like wings over their eggs to keep them from cooking.

Rabbits once denuded Liziansky Island and died as a result. Then grass that had been covered by wind-blown sand forced its way up, and frigate birds and blue-faced boobies came to call it home.

The noddy tern on Johnston Island is more fearful of man than most of these birds of the Pacific Islands.

Two female frigate birds are photographed on their nests while a red-footed booby with her downy young and an immature bird of the same species gather round as company.

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The Haitian green tree snake is a beautiful reptile of vivid leaf green living in trees and finding anolis and other lizards important items in their diet. The anolis lizard on the tree trunk needs to watch out if the tree snake is near with open jaws.



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The rhinoceros iguana lives in dens in the coral slabs of La Petite Gonaves Island, Haiti. They emerge to bask in the sun, often posing for long periods before their burrow entrances. Frequently six or seven of these large beasts may be seen gathered together in a group on the decayed limestone or up-raised coral. Photographs on these two pages by Gilbert C. Klingel.

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PRICKLY-PEAR CACTUS

A photographic study made at Wilson Station, Indiana
Dunes, by John Skara of Chicago.

★ Conservation ★

A section of Nature Magazine devoted each month to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

ARTHUR NEWTON PACK, *Editor*

A PLAN FOR ★ CONSERVATION

wildlife conference called by President Roosevelt. How successful this conference may be in unifying the various wildlife and game interests into a single group with a unanimously endorsed program of conservation is problematical, but there is a great opportunity that we believe the conference cannot well ignore.

First—the conference should demand an act of Congress to declare all wildlife (mammals, birds and fishes) to be natural resources whose protection is vital to the welfare of the nation as a whole. This action is essential because wildlife does not at present have such legal status, and there is consequently a question as to whether the federal government departments and bureaus are authorized to expend upon wildlife funds that are appropriated for the conservation of natural resources. It is also necessary because such a legal declaration would clarify many issues and tend to rule out the ridiculous assumption of certain "sportsman" and other groups as to rights of "ownership."

Second—the conference should set up some sort of representative machinery for the calling of future national conferences on wildlife.

Third—it is also of outstanding importance that the conference should recognize that if the federal government is to play a constructive part in protecting mammals, birds and fishes, it *must*, as the first step, set in order its own jumbled conservation system and begin to demonstrate upon the vast acreage of federally owned lands a consistently planned wildlife management policy, in which the tremendous economic value of wild creatures shall be given just and proportionate recognition.

On the following two pages we have presented our proposed outline of federal bureau reorganization under a centralized Bureau of Conservation of Renewable Natural Resources. Definite recommendation of some such general plan is vitally necessary.

Of course, even with consistent and effective management of all federal government lands, adequate needs of wildlife—mammals, birds and fishes—will still not be met, because only a small proportion of wildlife pro-

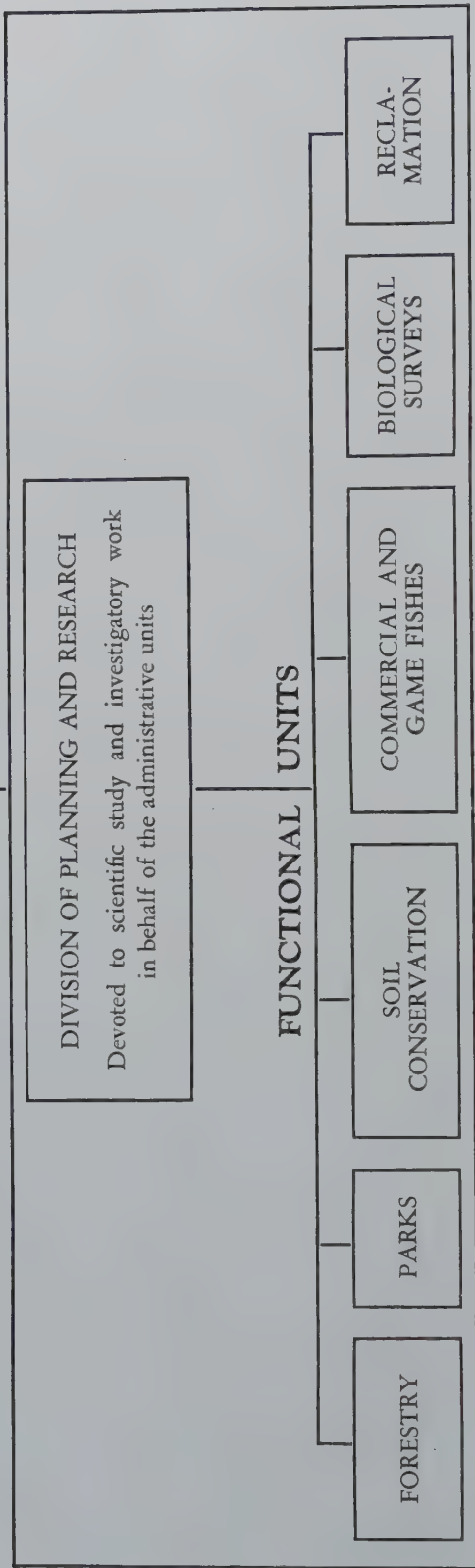
As we go to press there is being gathered in Washington the huge national

ducing land is federally-owned. In conjunction with our proposed reorganization plan, therefore, we also submit a proposal for federal cooperation with the states for further practical wildlife conservation. This proposal calls for federal subsidies to be granted to the states contingent on the recognition by the individual states of certain principles, and the necessity to observe certain definite conditions. The Clarke-McNary Act for the furtherance of forest protection and conservation affords a precedent for such procedure.

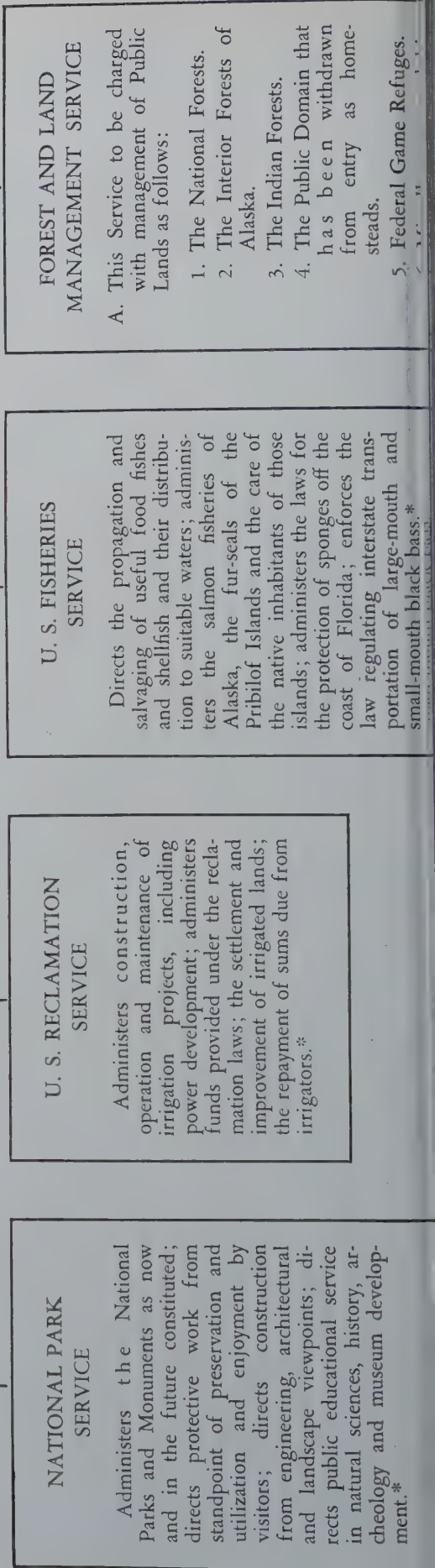
We have repeatedly set forth in these columns our insistent claim that the principle of devoting to wildlife conservation only such funds as may be paid in from a tax upon hunters in exchange for the right to kill is fundamentally unsound. This principle denies the co-ownership of wildlife by the non-killers and deprives them from having any voice in the management of an economic asset that is vital also to their enjoyment and welfare. Sportsmen are prone to emphasize the tremendous income accruing to the general public from their "sport"—the huge sums spent by hunters for gasoline, oil, food and shelter during hunting seasons. But they forget that even greater sums are spent for similar purposes by tourists and other visitors who are attracted to every wild region during the non-hunting seasons, and that the opportunity to see wild creatures in their haunts is an outstanding incentive to visit any section. Proprietors of tourist resorts, summer hotels and dude ranches unite in declaring that the chance to see wild creatures is an important asset to their business and generally provides more revenue than that resulting from the brief hunting season.

We maintain that the administration of wildlife (including those forms which are classified as game) should be provided for by the state, just as it provides for roads, police protection or the administration of any other laws for the public good. There should, of course, be a tax on hunters just as there is a tax on automobiles or automobile drivers, but the revenue from such a tax should not limit the expenditure by the state for wildlife protection. We are not impressed by the claims of the sportsmen that this theory will result in "returning wildlife administration to politics." A "non-political" Game and Fish Commission is (Continued on page 172)

Director of Conservation of Renewable Natural Resources



TERRITORIAL UNITS



THE OBJECTIVES OF THIS PLAN

To eliminate the jealousies, competitions, inefficiencies and injustices inherent in the administration by different departments of our renewable natural resources, and to bring about the development of these vital resources scientifically and economically for the benefit of all of the people.

STEPS NEEDED FOR THE EXECUTION OF THE PLAN

1. Transfer to the Department of Agriculture from the Department of the Interior, and place under a single Director of Conservation of Renewable Natural Resources:

- A. The National Park Service.
- B. The Division of Grazing (together with all of the so-called Public Domain that has been withdrawn from homestead entry).
- C. The U. S. Reclamation Service.
- D. The Interior Forests of Alaska.
- E. The Indian Forests.
- F. Administration of the Alaskan Reindeer.

2. Transfer to the Department of Agriculture from the Department of Commerce and place under the Director of Conservation of Renewable Natural Resources:

- A. The U. S. Bureau of Fisheries.
- 3. Place under the Director of Conservation of Renewable Natural Resources, with full authority to divide and reorganize, the following bureaus already under the Department of Agriculture:
 - A. The U. S. Forest Service.
 - B. The U. S. Biological Survey.
 - C. Administration of so-called submarginal land purchased by the United States.

4. Provide by Act of Congress for direct subsidies to the states (through the Director of Conservation of Renewable Natural Resources) for wildlife protection and propagation—these subsidies to be conditioned upon acceptance by the individual states of the principle of ownership of wildlife not merely by those who pay a tax for the right to kill but by all citizens of the state. Such subsidies to the states may also be for the purpose of controlling predatory animals where such control is necessary.

United States.

7. Sub-marginal land purchased by the United States.

B. On these public lands this Service (with the aid of the central Division of Planning and Research) would perform and coordinate the functions incident to:

- 1. Forest conservation.
- 2. Soil conservation.
- 3. Game and other wildlife conservation and restoration subject to the rights of the states.
- 4. Grazing administration.
- 5. Recreational development.
- 6. Civilian Conservation Corps work.

C. This Service would also perform functions in cooperation with the states, private industries and individuals for attainment of conservation of forests, soil and wildlife as have been or may be delegated to it by acts of Congress.

D. The administration of the Forest and Land Management Service should be by division of the territory under its jurisdiction into regions after the manner of the present Forest Service which it would replace. The various Regional Directors should be given a maximum of authority, thus enabling close following of local conditions and the best possible cooperation with individual states.

(Continued from page 169) obtainable regardless of the source of revenue. State Forestry and Conservation Commissions are not supported solely by the revenue from State Forests and yet they accomplish results at least as good as do the State Game and Fish Commissions.

We propose that, subject to the recognition by individual states of this progressive theory of wildlife ownership by all the people instead of by the sportsmen alone, the federal government, duly authorized by Act of Congress, should grant subsidies or other financial aid to the states to aid in wildlife restoration and protection on non-federal land. We believe that this method would guarantee better enforcement of wildlife regulations under the Migratory Bird Treaty Act than under the present system of federal plus state wardens.

We also propose that the whole system of predator and rodent control now performed directly by the United States Biological Survey within the various states be abolished. This practice undertakes what is generally regarded as a local or state function and sets up a large group of salaried persons whose continuity of employment depends upon their fomenting a constant emergency of anti-predator hysteria. Where there are large areas of government owned wild land there is frequently a real need to reduce predators and rodents, but this control work should be done, not by a separate agency, but by that government unit territorially charged with the administration of all the related functions of land use. Insofar as the roving habit of predatory animals is an obstacle to good wildlife manage-

ment in the interests of all the people of a state, then, in lieu of the present system of directly hired federal hunters, trappers and poisoners, the federal government, through the Bureau of Conservation of Renewable Natural Resources, should make a subsidy or grant to the individual states, which money may be expended only under the direction of the State Wildlife Commission, which is a more appropriate name for the organization generally termed the State Game and Fish Commission.

The problem of wildlife conservation is everywhere so handicapped by the lack of money that we believe its demands can be solved fairly only by application of the principles of federal aid here set forth. We firmly believe that our wild mammals, birds and fishes, representing the basic motive for the annual expenditure of billions of dollars by the people of the United States, are deserving of federal recognition and support for the national welfare in just proportion to that expenditure and prosperity which they create—just as are other uses of wild land that have already been fostered by this type of federal aid.

This is the dual program that we submit to the Wildlife Conference: (1) Federal government recognition of wildlife as belonging definitely in the category of renewable natural resources for the conservation of which federal aid may be extended; (2) Federal bureau reorganization. If this program is adopted in principle it will go far towards the solution of those problems for consideration of which the Conference has been called.

BENDING THE TWIG

Our national awakening to the vital need of wildlife conservation has been a laggard process, but there are various indications that at least there *is* an awakening. One of the most interesting and significant manifestations of this has been the demand for conservation instruction in the schools. Wisconsin and Florida have passed laws requiring conservation education. Other states have been furthering it without legislative order. Indications are that there will be a definite spread of this idea in the early future.

Just how much of the remnants of the renewable natural resources of America we shall be able to pass on to the next generation is, in many directions, uncertain. Our migratory waterfowl, upland game birds and fur-bearing animals are still in the main regarded as something to be killed rather than as a vital part of American life. There is hope that a better sense of values may be achieved, and that real conservation may be substituted for destruction before it is too late.

Assuming that this goal can be accomplished, tremendous possibilities lie in planting in the minds of the men and women of tomorrow the truth about conservation. They should learn the facts about the broad values of these renewable natural resources. They must be given

knowledge that will enable them to distinguish the selfish, specious propaganda of those whose sole interest in wildlife is as a means of selling arms and ammunition, or to recognize the claims of those whose only use for wildlife is its destruction. Many of our renewable natural resources are in a far too precarious position to overlook anything that may be done in their behalf, either now or in the future.

We have received many appeals for information that will aid in conservation teaching. This department each month only partly fulfills that need. Material available from the National Association of Audubon Societies and the Emergency Conservation Committee and many other organizations, state, local and unaffiliated, is valuable. But all of them fail to fill the need completely. Comprehensive programs for teacher use are needed, and these should be the result of collaboration between individuals well grounded in the truth of the wildlife situation and educators who know how to present these truths. This will take time, but the American Nature Association hopes soon to make available a modest beginning in this direction.

In the meantime, we must not overlook the vital importance of using all worthy sources of material in the task of bending the twig of youth toward the sunlight of an aroused appreciation of wildlife.

WHAT PRICE POWER?

Santee-Cooper project means devastation of important wildlife region

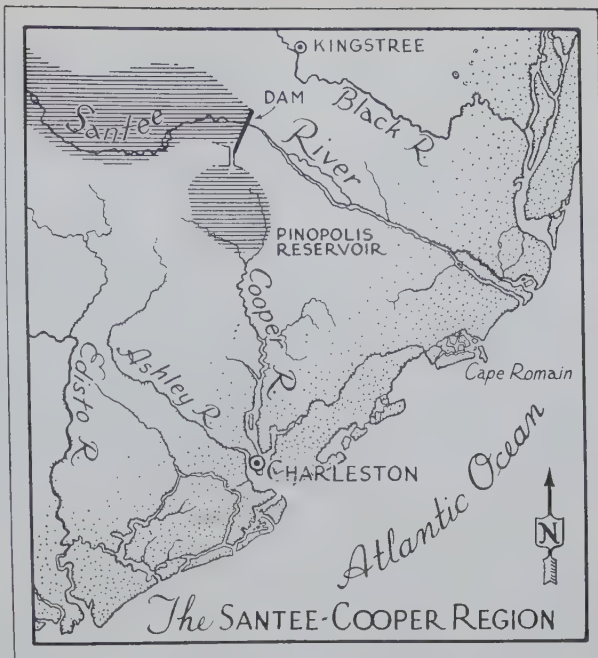
By ARCHIBALD RUTLEDGE

IN EVERY arduous undertaking, it is wise to consider, before the work is begun, not only what is to be gained but also what is likely to be lost. When nothing that will be gained can possibly make up for what is lost, to prosecute the plan is senseless. Now, the Santee-Cooper project is an undertaking that has ardent advocates and even more ardent opposers. I think the advocates have either not properly weighed what is to be lost by this project, or else they do not value what will be lost. They bring to mind the old saying, " 'Tis commonly the man on shore who cries, 'Don't give up the ship!' "

The idea of this Government project is simply stated: Roughly, some sixty miles from their mouths, the Santee and Cooper Rivers in South Carolina run parallel and rather close to each other; and, what is most unusual in flat country, the Santee at that point is sufficiently higher than the Cooper to permit of a hydro-electric plant if the waters of the former are diverted into the latter. Plans for this project have been made and approved by the Government, and the South Carolina Supreme Court has held the matter to be constitutional. The work, it is estimated, will take from two to three years. The cost will be close to forty million dollars. Ten thousand men will be given employment. Ample electric power will be given a vast territory. A short water-route will be supplied between Charleston, the chief seaport of the State, and Columbia, the capital, which lies 130 miles inland.

The advocates of this plan see these supposed advantages; but they appear blind to the objections to it. As I am native to the region affected, and as I have followed this project from its inception, it is possible for me to get their viewpoint; but careful consideration of the whole scheme compels me to feel that its effect on conservation will be nothing short of calamitous. Indeed, so grave is the menace that I believe every lover of wild life, every sportsman, every one who appreciates the charm of the primeval wilderness, every one who reveres the sacredness of ancient properties, held inviolate by families since long before the Revolution, should unite against the perpetration of this crime. I call it a crime; for it is the story of the acquirement of power at the expense of charm.

Now, if the power were really needed, the case might be different. I for one would be willing to make a sacrifice for the public welfare. But it is a fact that the efficient South Carolina Power Company now supplies the whole region in question with all the power it needs or is likely



SITE OF THE SANTEE-COOPER POWER PROJECT

The shaded parts show approximately the areas that will be flooded. From the dam to the sea the Santee Valley will be ruined for wildlife by the destruction of the rich bottomland forests, and the intrusion of salt water.

to need for a generation. This project therefore is merely a case in which the Government is entering into competition with a private company, to supply a commodity that is already cheaply supplied. Moreover, the railroads, which now carry freight between Columbia and Charleston will have to compete with freight-boats; and all of us know that the railroads can stand no further competition. Viewed calmly and sanely, the Santee-Cooper project is not only wrong but useless. It offers to give what we already have.

If it be argued that it will employ multitudes of men, let it be considered that those same men could be employed on projects infinitely more useful. There is plenty of work that really ought to be done. I can not bring myself to believe that men should be employed on work that ought not to be done.

Aside from the fact that there is no real need for the power that is to be created by damming the Santee, consider what will be the effect on the great Santee itself, and on the properties served by it. This river is one of the principal navigable streams of the State. There have been regular steamer lines from the ocean to Columbia. If this scheme becomes a reality, there will be no more navigation. Fourteen miles from its mouth, the river divides into North and South Santee. Between these branches lies the great Santee Delta, a region which formerly was one of the principal rice-growing centres of America. But now it has reverted to nature. I hardly know in all our country a better sanctuary for wildlife. It is a riviera for migrated wildfowl. Deer and turkeys find there a security that exists nowhere else. And how will it be affected by the diverting of the waters of the Santee? I think I know; for my own plantation is on the Santee, opposite the Delta.

We have now very strong tidewater in the river; and when tropical storms assail the coast, twelve miles away, I have known the salt water to come almost to "Hampton," my home, and utterly to destroy rice-crops just below me. With most of the water gone from the river, the salt tide is sure to invade the whole delta region. All trees, plants, wild flowers, birds, and animals that delight in a fresh-water region but cannot stand salt water—these will either perish or will remove to other haunts. The Santee Delta is an invaluable sanctuary for wild-life; and it will vanish when the river ceases to be a river and becomes a mere brackish estuary.

Not less unfortunate will be the effect on the owners of properties adjacent to the river. Of late years the growing of rice on a considerable scale has been resumed. In one such field I have seen more than two hundred negroes at work at one time. But the project will end rice-growing in one of the best rice-growing regions of the world; and with the rice will go the wild ducks, which winter on the Delta by hundreds of thousands.

But the graver damage will be done above the dam. Where such dams have been built in other parts of the country, the regions flooded have commonly not been of any special significance. But here we have a case in which one of the most historic, romantic, and picturesque parts of our country is to be ruthlessly covered by a vast yellow flood: ancient plantation homes, churches and churchyards where sleep Revolutionary patriots, marvelous homes of the dwellers of the wilderness, forests that jaded Euro-

peans cross the ocean to see, swamps that hold all the mystery and majesty of things primeval. The gentle retired life of the whole rural communities, the winsome pineland roads leading from hospitable home to home, ancestral acres for which original deeds are held—all will be submerged forever.

Thousands upon thousands of acres of forest and swamp that are ideal refuges for wildlife will vanish; and in their stead will be a muddy lake, and a big power-house; a lake that nobody who loves beauty could ever love, and a power-house that will stand as a monument to folly. In ancient days a fool sold his birthright for a mess of pottage. I honestly hate to see my birthright sold for a power-house.

If I were asked to give the salient reason why South Carolina has been able to recover from the fearful ravages of the Civil War, I should, of course, say, the gallantry of her people's hearts; but there is another reason that should not be overlooked: it is the coming to her romantic shores of countless charming visitors. Why do they come? What do they seek? They are allured by Charm; and everything that detracts from that charm will turn them elsewhere. Some people think it will be good business to make of Charleston a Pittsburgh or an Atlantic City; but those who vision more deeply cannot fail to resent the destruction of beauty, both because they love it for its own sake, and because it has a financial worth exceeding the value of any mechanical power that can be created by sacrificing it.

Waterfowl Beauty

CONTRIBUTED BY A BIRD-LOVING FRIEND

ON THE broad, wind-whipped river, the first sharp day of winter, appeared small wisps of waterfowl. A token of the changing year, all unheralded they came, as suddenly and mysteriously as blossoms from the brown earth in spring. Vivid in color, clean as the north wind that brought them, they bedecked, in truth they did enflower, the clouded stream. Jauntily as flowers tossing in the wind they rode the whitening waves, but more richly endowed than flowers they wheeled and turned, bobbed and dived, sprightly and eager, full of the joy of living.

Beholding them was a sight to bring surging upward all of the love of natural beauty a soul can feel, an experience to make that day stand out in memory as a thing apart.

And yet, and yet, there are those who do not sense such

loveliness, and others who seek only to covet it. How the sight of beautiful wildings, expressing every moment the ecstasy of life, can arouse a yearning to kill is impossible for a lover of Nature to understand. To terminate such happiness, to destroy such beauty, to desire in a spirit of wanton selfishness to possess and consume something that, left alone, can be a joy and an inspiration—to all capable of such feelings—is to depart altogether from the altruism that is supposed to be one of the highest attainments of a civilized being. It is easy to destroy priceless, living beauty, that neither man nor Nature can replace, beauty that once gone will be lost forever, but it is easier still to preserve it—only a little self-denial is required. Oh, people who destroy! Will you not stay your hands in time; will you not forget self a little for the good of all? Oh, humans! Pray demonstrate sometime that humanity is not falsely so-called; spare, conserve, protect, while there still remains something of the wondrous beauty of the wild.

SAND LAKE WATERFOWL REFUGE

It is announced by the Department of Agriculture that a strip of land seventeen miles long and from two to four miles wide, running along the James River in Brown County, South Dakota, has been estab-

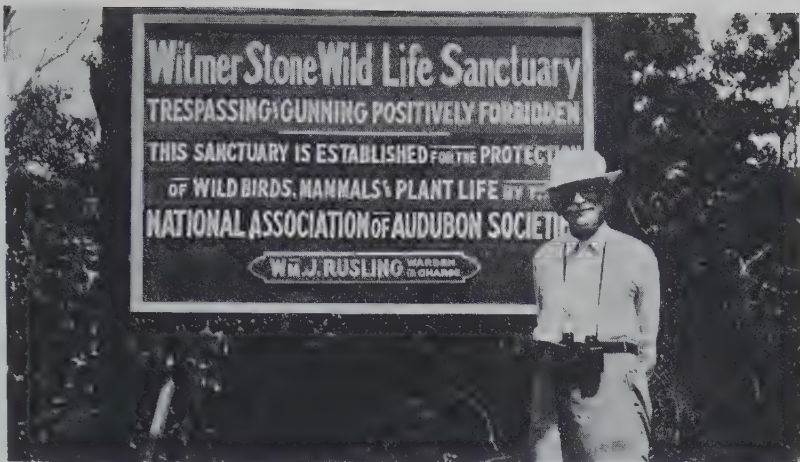
lished by Executive Order as the Sand Lake Waterfowl Refuge. It was formerly a populous breeding place for waterfowl, but has become practically useless to the birds as a result of prolonged drought. Three lakes remain, and these and their environs are being improved by a C. C. C. camp in an endeavor to restore conditions suitable for waterfowl occupancy.

Sanctuary or Slaughter Pen?

Bird concentration areas may be one or the other

By ROBERT P. ALLEN

National Association of Audubon Societies



FOR many years it has been the good fortune of naturalists, and especially bird students, to visit the southernmost tip of New Jersey during the autumn months. There are few places on the continent more ideally situated, geographically, for concentrating and harboring great numbers of migratory birds. But, as is usual with such areas, the woods at Cape May Point have attracted a potent enemy of birds; the man with the gun. This is an example of a situation that seems to be inevitable: a natural phenomenon that is of thrilling and breathtaking dimensions to one man inspires his neighbor to run for a shotgun.

The local residents have always claimed, almost as a birthright, the privilege of taking what birds they pleased from the immense flocks that annually visit their county. Robins, thrushes, flickers, woodcock and various hawks were shot and netted almost without restriction. "Flicker poles" were formerly used, devices for wholesale slaughter that are still operated on the Eastern Shore of Maryland and elsewhere. Most of the kill was taken home for the pot, including the smaller hawks, whose rich breast meat is considered very palatable.

Of course a good many non-edible birds—night herons,

crows, vultures and ospreys—were shot down "for the fun of seeing them drop," or for "target practice." Many gunners protested to me, on more than one occasion, that it was a shame that they were not allowed to shoot at any hawk that came along, as it was so convenient to get such practice just before the opening of the hunting season!

Protective laws have not been strong enough medicine, and an habitual disregard for them proved contagious.

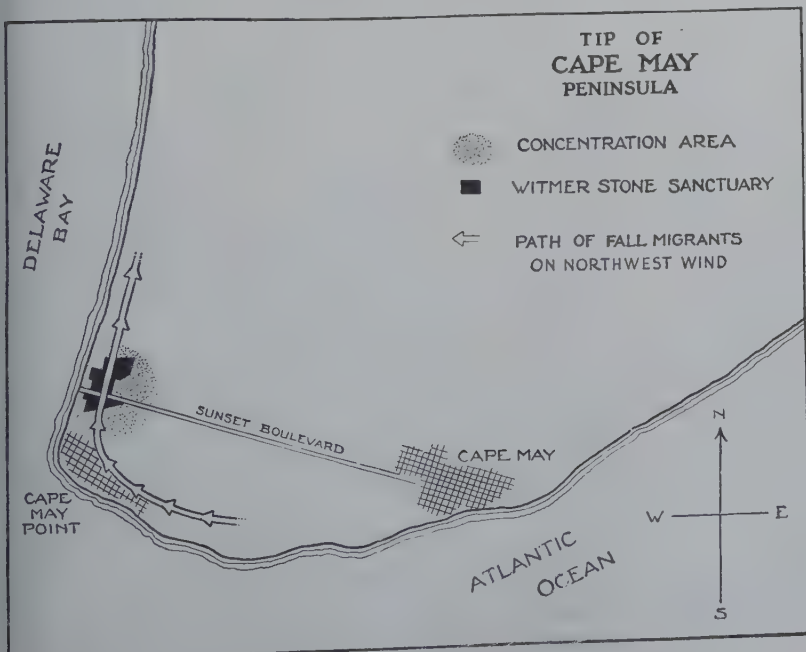
A solution to this problem has been worked out at Cape May Point during the last five years and is nearing perfection in the Witmer Stone Wild Life Sanctuary, established in the fall of 1935 by the National Association of Audubon Societies.

In order that the all-important relationship of the sanctuary to the migratory flights may be understood, the latter should be briefly explained.

The tip of New Jersey may be compared to the mouth of a giant funnel. Under ordinary conditions the fall migrants that journey southward along the coastal strip move towards the bottom of the funnel along its seaward side. Their numbers are large but not overwhelming. More important lanes of travel lie inland in parallel lines along the ridges. A strong wind from the northwest strikes these

lines of flight at right angles. If the blow is heavy, all but the strongest flyers are forced to give way, and, like aerial sailing ships, to "run before it".

When this happens in the region north and northwest of New Jersey, it brings immense flocks pouring into the top of our theoretical funnel. Striking the outer edge—the Atlantic Ocean—they struggle southward into the funnel's mouth, often clinging precariously to the outer strips. Doubtless many are carried out to sea and, on the tail of a



THE LOCATION OF THE SANCTUARY AT CAPE MAY

Above is Dr. Witmer Stone, noted ornithologist and botanist, who started the movement for the protection of bird life here, and in whose honor the sanctuary is named

A SPANISH OAK GLADE IN WITMER STONE SANCTUARY

This is an area notably suited to its purpose—bird protection in a concentration area

northwester, a few such flocks have actually been observed making their way wearily back to land. It is certain that most of these sea-blown migrants never return to the land.

As these augmented flocks move southward into the neck of the funnel, they are crowded closer and closer together. The farther south they go the greater the density of the flocks. When the jumping-off place is reached, at Cape May Point, this density becomes an amazing concentration of bird life. At this juncture the massed flocks do not pour out of the funnel's mouth to flow serenely onward, fan-wise, across the fifteen-mile width of Delaware Bay. The northwester generally continues to blow throughout the day and an immediate crossing would obviously mean disaster. Instead of making the attempt, the birds round the curve of the Cape and work northward, uncertain as to the next move.

Thus it is that the inviting woods area, which lies directly under this northward flight lane, is so abundantly resorted to by migrants. With its generous cover and food-bearing plants, it is a natural, made-to-order *sanctuary*.

Both legal and illegal gunning have contributed toward making this concentration point a shambles rather than a sanctuary, however. The temptation to shoot more than the limit of woodcock, for example, seems to be irresistible when the birds get up from every available cover. Indeed, the immense numbers of birds appear to have inspired the local nimrods to all sorts of heroic deeds. Close by, in a heavy stand of conifers, migrating barn owls gather. I have seen a flock of more than one hundred of these birds in this thicket. One "sportsman," who must have passed half the previous night reading up on the exploits of Daniel Boone and Kit Carson, went into these sheltering pines and slaughtered enough owls "to make a wagonload," according to indignant local people. This was too much for them; but, after all, owls are not good eating!

From time to time a few local and summer residents protested these outrageous practices, chief among them Dr. Witmer Stone, the well-known ornithologist and editor of *The Auk*. These protests, vehement as they were, seemed lost on indifferent and calloused ears. But this was not the case. Others became interested and, finally, alert members of the Delaware Valley Ornithological Club, of Philadelphia, laid the whole matter before the National Association of Audubon Societies.

This was in 1930. The following year the Audubon Association inaugurated a cooperative investigation with the New Jersey Board of Fish and Game Commissioners. Illegal shooting was stopped nearly 100 per cent, food habits of hawks in migration were studied, the flight it-



PHOTOGRAPH BY ROGER TORY PETERSON

self was carefully observed and recorded, and local people were educated in identification of raptors and in general conservation matters.

Finally, in the summer of 1935, plans were made by the Audubon Association to set aside as much of the concentration area as possible. Twenty-five acres of the most strategic part of the wooded section were leased. Local opposition among the gunners flared, and then subsided before the wholesome nature of the project. In the first week of August a warden, well qualified as an ornithologist, was placed on the job. The area was posted and its limits indicated for the benefit of possible trespassers. The warden kept a detailed record of migrants, making daily reports to the home office.

No serious difficulties were encountered during the fifteen weeks' season. Bisected by a paved county road, whereon gunning is legal under present laws, the inviolate character of the sanctuary area presents a remarkable contrast. The gunners were made to keep strictly within bounds, and air rights vertically above our leased property were maintained.

The sanctuary is more than merely a "no-shooting area"; it is a Mecca for bird students and for botanists as well. A total of 198 species and an estimated total of 124,000 individual birds were recorded during the 15 weeks of 1935. Two hundred and fifty species have been known to occur in the immediate region. Typical plants include the prevailing Spanish Oak, the pond pine, holly, purple lady-slipper and slender lycopodium.

What has been accomplished by the establishment of the Witmer Stone Wild Life Sanctuary in New Jersey can be done at other concentration points or along heavy flight lines elsewhere. The Emergency Conservation Committee of New York City pioneered in a similar effort at Hawk Mountain in Pennsylvania, with notable success. Investigations are revealing "bird traps" at other points, and every last one of these should be a sanctuary—their natural rôle—instead of the shameful slaughter pens that man's blundering presence has made of them.

We Are Taken to Task

CONTROVERSY is healthful and differences of opinion often serve ultimately to bring about the best solution of important problems. Mrs. Charles N. Edge, Chairman of the Emergency Conservation Committee, an organization doing valuable and militant work in behalf of conservation, differs with certain things we have said in these pages. We are pleased to print, in full, the following letter expressing these differences in behalf of her committee. Mrs. Edge writes:

Dear Sir:

We note with anxiety two articles in Nature Magazine, "But Who Pays?" by Tom Gill, in the October, 1935, issue, and "Let's Get Together", by Arthur N. Pack, in the issue of January, 1936, favoring the transfer of the National Parks to the Department of Agriculture, and the "merging" of the National Park Service in the Forest Service.

Both Mr. Gill and Mr. Pack assure us of their interest in the welfare of the National Park system. However, a merger such as these gentlemen urge would be hailed with delight by all who look enviously over the boundaries from the outside of the National Parks—by the sheep and cattle men, the lumbermen, the wood pulp manufacturers and other interests.

We, also, deplore the hostility and jealousy that exists between the Forest Service and the National Park Service, and the resulting injury to the public and to the Parks. We must, however, point out that it is the same kind of mutual misunderstanding that exists between a wolf and a lamb. The huge and politically powerful Forest Service, with its commercial view of natural resources, with its valuable timber, grazing and other privileges to dispense, represents the wolf; and the small and politically weak National Park Service represents the lamb. Any "merger" that would take place between the two bureaus would be of the same nature that threatened Little Red Riding Hood!

If we look back on the history of the National Parks we find that the Forest Service has always been the persistent enemy of the Parks, coveting every acre of marketable timber in the National Parks. Again and again it has made attempts to slip legislation through Congress to eliminate from the Parks, and turn over to the Forests, for sale for lumber, the finest stands of timber within Park boundaries.

It may be that the Forest Service did not instigate such destructive raids on the National Parks as the two trimmings of Yosemite Park, by which that Park lost most of its magnificent sugar pines; or the attempted elimination of nearly half of Sequoia Park in 1921-1924; or the plans (fortunately not successful) developed in 1926 for trimming out the finely timbered parts of Crater Lake Park. No doubt lumber interests were behind these schemes, but it was the Forest Service that was to receive the spoils, and be the intermediary in their exploitation, and Forest Service officials promoted the projects.

Why are the important bills, now pending in Congress, for rounding out and completing the National Park system blocked year after year while road building, logging, settlement of the areas, and destructive exploitation are progressively ruining them? What is holding up the Wallgren Mt. Olympus Park bill, the Nye Yosemite Sugar Pine bill, the Kings Canyon Park bill, the acceptance of the Rockefeller donation for the enlargement of Grand Teton Park, except the opposition of the Forest Service, and the local commercial opposition which this bureau instigates, marshalls and renders concerted and effective?

Let us not forget how the Forest Service actively opposed the Great Smoky Mountain Park up to the last minute it dared to; how it fought the establishment of Rocky Mountain Park and secured the paring down of the limits of that park to a mere skeleton. Observe what the Forest Service did to the splendid Mt. Olympus National Monument, established by President Theodore Roosevelt, and left in charge of the Department of Agriculture. This fine area, which, though called a "monument", and established by proclamation instead of by act of Congress, was

a magnificent national park in everything but name and legal safeguards. In 1915 the Forest Service in *practical secrecy* secured a proclamation from President Wilson cutting it down to half its original size, and turning over to the Forest Service every bit of the splendid big timber that was one of the two main purposes of the "Monument" to preserve permanently. A large part of this timber has since been sold and ruthlessly logged off without any pretense of forestry, selective cutting, rotation periods or anything else;—just logged off.

Mr. Pack questions whether the wildlife needs absolute permanent sanctuary, whether grazing of domestic stock should be prohibited, or only "carefully regulated", or whether certain areas should not "be opened for carefully guaranteed selective logging from time to time." Nowhere in the Northwest does game need permanent protection more than in this area. Sheep grazing is not to be thought of among these mountains. In the dense stands of enormous trees in the Olympic forests selective logging is entirely impracticable. Any logging whatever wrecks the forest, and only clean cutting is a commercial possibility.

We deplore Mr. Pack's opposition to the Wallgren Mt. Olympus National Park bill now pending in Congress. This bill would do something toward compensating the nation for the loss inflicted on it in trimming the Mt. Olympus National Monument, as described above. It would insure saving a few square miles of the last of the wonderful fir forests of the northwest, with trees up to 300 feet in height and of great age and size. It may soon be too late to save these forests.

Mr. Pack wants "a special kind of national recreation area which partakes of both Park and Forest." He says: "Under such management as we propose, lumbering, grazing of domestic stock, wild life management and recreational development could, and should be, separately considered." Such a "park" would be the battle ground for an array of antagonistic purposes.

Has the Forest Service ever set aside for permanent preservation any sample areas of the finest stands of the different types of forest on the government lands? The finer the timber, the greater has been the haste with which it has been turned over to lumbermen. The finest stands in the National Forests are nearly all gone. We quote a significant sentence from the article by Tom Gill:

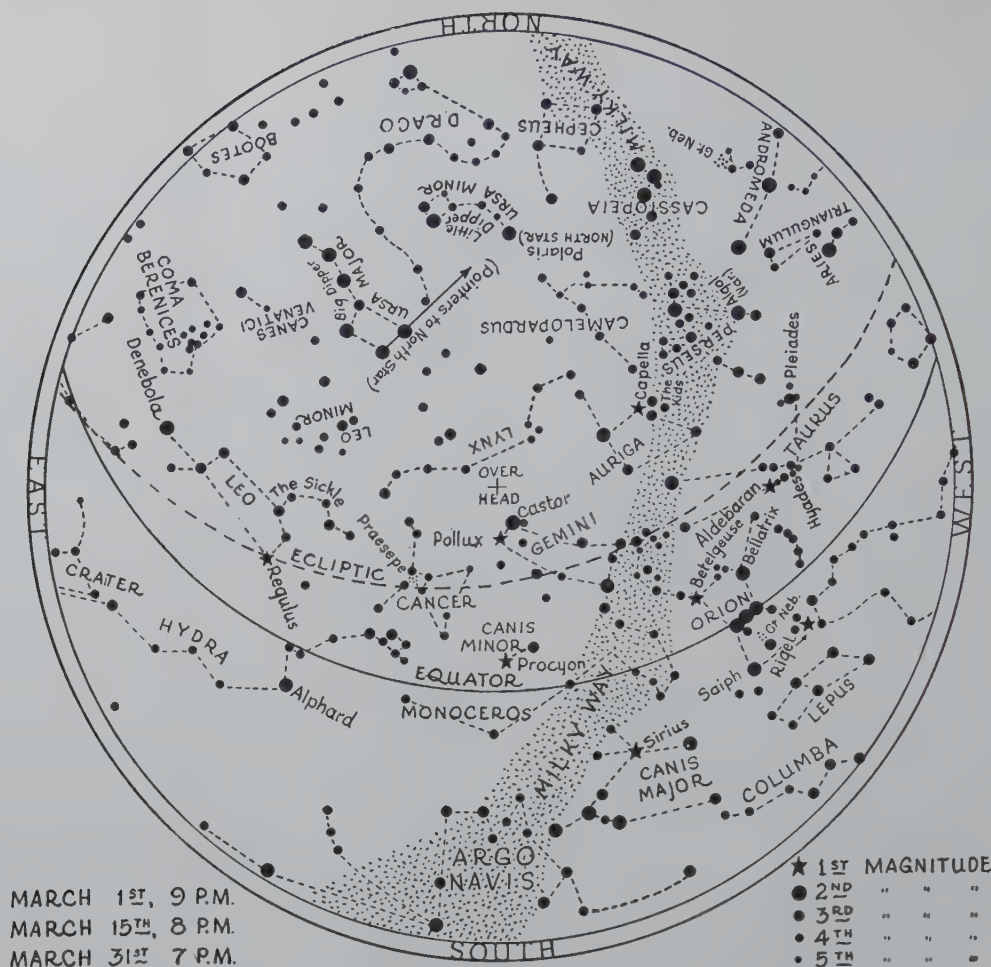
"For years the Forest Service has been kept in a state of chronic irritation because of this process of sniping off its National Forests lands to enlarge the National Parks".

Notice the words "*its* National Forests". Since when has the Forest Service *owned* the National Forests? If the American nation wants to set aside for Park purposes a few unique scenic places in its own forest lands, is it not to be allowed to do so?

Mr. Pack says that the Park Service, as at present constituted, cannot secure such a scheme of land management as he wishes. We are thankful that the Park Service is not under such lax laws that it would be subject to temptation to exploitation, and to pressure from commercial interests that would be brought to bear on it. We pray that the National Parks may be defended from the depredations of the Forest Service and preserved inviolate for the benefit of generations to come.

We cannot, at this time, enter into further discussion of the points raised in this letter. We must state, however, that we *do not* and have never favored any merger of the Park Service with the Forest Service. We believe that the National Parks as now constituted should be preserved inviolate, and extended where advisable. We *do* believe that the National Park Service in its entirety, together with all other branches of the government concerned territorially or functionally with the administration of our renewable natural resources, should be transferred to the Department of Agriculture under the program outlined elsewhere in these pages.

ARTHUR NEWTON PACK.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south

New Boundaries for Old Constellations

By ISABEL M. LEWIS

ONE of the more recent interesting changes adopted by the International Astronomical Union has been the readjustment of the boundaries between constellations. Instead of straggling lines that never followed exactly the same course in different star atlases, the boundaries are now arcs of circles on the celestial sphere running along hour circles or parallels of declination, which correspond, respectively, to circles of longitude and latitude on the earth.

This makes it easy to compare the various constellations in area, expressed either in square degrees or in proportion of the entire heavens that each covers. This has been done by A. E. Levin in a recent publication of the British Astronomical Association. The calculations were based upon *Delimitation Scientifique des Constellations*, by E. Delporte, Astronomer of the Royal Observatory of Belgium. These findings were adopted by the International Union. In it there are eighty-nine constellations covering the entire heavens. Forty-eight of these are the well-known constellations that were listed

by Ptolemy, called the ancient forty-eight, including the twelve of the zodiac, twenty-one northern and fifteen southern constellations. The remainder are the so-called modern constellations that were formed, mostly by the uranographers of the 16th and 17th centuries. These were based upon observations of stars made by explorers who sailed boldly away to the New World after the discovery of America and brought back news of discoveries of new stars as well as of new lands. Great gaps that had existed in old star maps were then filled in with new constellations. The names and outlines of the constellations adopted by Argelander, well-known uranographer of the nineteenth century, have been followed as closely as possible for the northern constellations, and those of Gould for the southern hemisphere.

By far the greatest of all the constellations was Argo Navis, The Ship Argo, of the southern hemisphere, but in the new classification this constellation no longer exists as one constellation. Its great sub-divisions, Carina, The Keel; Puppis, The Stern; Vela, The Sails; Pyxis, The

Mariner's Compass, are now independent constellations. The proportion of the heavens covered by all these constellations that belonged originally to Argo Navis is about five-hundredths of the whole area or nearly 1900 square degrees. The old constellation of Malus, The Mast, is no longer recognized and its stars are included in Eridanus.

The largest of all the constellations with the newly-adopted boundaries is Hydra, The Water-snake, which covers about three-hundredths of the area of the heavens and contains 1303 square degrees. The zodiacal constellation of Virgo, The Virgin, is a close second with an area of 1294 square degrees, and Ursa Major, within whose boundaries lies the Big Dipper, is only 14 degrees smaller than Virgo. All three, then, are nearly equal in size, although differing greatly in shape. Virgo and Hydra are now rising above the eastern horizon while Ursa Major fills a great part of the northeastern sky. Next in order of size come Cetus, The Whale; Hercules; Eridanus, The Sky River, which runs far below the southern horizon; Pegasus, The Winged Horse; Draco, The Dragon; Centaurus, The Centaur, one of the finest constellations of the southern hemisphere that surrounds on three sides Crux, The Southern Cross, smallest of all the constellations, and Aquarius. These ten constellations combined cover more than one-fourth of the entire area of the heavens.

Serpens, which Ophiuchus, The Serpent-bearer, grasps with both hands, has been divided into two constellations, Serpens Caput, south of the Northern Crown, and Serpens Cauda, east of Ophiuchus. Counting these two as one the total number of constellations is eighty-eight.

Orion, which is universally considered the finest of all the constellations, ranks twenty-fifth in size, while Leo, The Lion, ranks twelfth. This is one of the finest of the spring constellations and may be seen these evenings high in the eastern sky.

The smallest of all the constellations is Crux, The Southern Cross, with an area of only sixty-eight square degrees. It would take about nineteen such constellations to make one the size of Hydra. Not much greater than Crux in size is Equuleus, The Little Horse, which lies half way between the head of Pegasus and Delphinus, The Dolphin. It is only four square degrees larger than Crux. Sagitta, The Arrow, which lies in the Milky Way below the Northern Cross is the third smallest with an area of only eighty square degrees. Next in order of increasing size come Circinus, The Pair of Compasses, a modern constellation in the southern hemisphere near Centaurus; Scutum or Scutum Sobieskii, which lies in a very brilliant part of the Milky Way directly north of Sagittarius; Triangulum Australe, in the southern circumpolar sky; Reticulum, also a constellation of the southern hemisphere; Caelum, The Burin or Graving Tool, between Eridanus, and Columba, The Dove, now lying close to our southwestern horizon; Corona Aus-

tralis, The Southern Crown, which is visible low in the southern sky in summer between Sagittarius and the tail of Scorpio. Last among the ten smallest constellations is Chamæleon, an inconspicuous little group in the vicinity of the south pole of the heavens. The last named is less than twice the size of Crux.

With the exception of Crux, which contains a star of first magnitude, another of second magnitude, and two of the third, all of these constellations are composed of faint stars of fourth magnitude or less. Next to Crux, Sagitta, Scutum, and Corona Australis are probably the most interesting. Scutum was named for John Sobieski, The Third, a noted military hero of Poland and represents his coat of arms, the sign of the Cross emblazoned on his shield.

Some of the constellations of the northern sky that seem to us unusually small are considerably larger than the ten smallest. Delphinus, known popularly as Job's Coffin, south of Cygnus and next to Sagitta on the east, stands nineteenth from the bottom of the list of constellations in order of size. Lyra, also one of our smaller constellations, is not far below the average in size. Perseus and Cassiopeia, now in the northwestern sky in the early evening, both exceed Orion in size, but by only a few square degrees.

The appearance of the heavens on an early spring evening is exceptionally interesting for in the western half of the sky may still be seen all of the most brilliant winter constellations, while in the eastern sky are appearing the groups that herald the arrival of spring with their milder radiance. Among these are Cancer, Leo, Virgo, Hydra and, far over in the northeast, Bootes and Coma Berenices. The great equilateral triangle formed by the two Dog-stars, Sirius and Procyon, with Betelgeuse in Orion, is now conspicuous in the southwest. Ursa Major is now coming into its best position for observation in the evening as it approaches the meridian high above the pole. The Sickle in Leo is conspicuous in the east and the head of Hydra may be identified in the small group of stars below the Beehive in Cancer, which is a fine cluster visible faintly to the naked eye but seen at its best in a small telescope or field glass. Alphard in Hydra is well named, The Lonely One, for it lies in a region where there is a dearth of bright stars. A star of second magnitude, it is the only bright star in the constellation.

Among the planets this month Mercury will be a morning star but poorly placed for observation. Saturn also will be too near the sun to be observed. It will be in conjunction with the sun on March 3. Venus may be seen in the east shortly before sunrise and Jupiter will be nearly due south at sunrise on March 14. Mars is still in the evening sky setting about two hours after the sun.

Spring will begin on March 20 at 1:58 P. M. Eastern time when the sun will cross the equator coming north.

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Trailside Treasures

THE UNDERGROUND CRADLE

By JANE ADAMS PARKER

"I DON'T see how Jackie can possibly join in our treasure hunts, when he has to sit in his chair all day," said Jerry.

"Well," said Aunt Dot, "I figured it out after we got home from his house. Then I talked it over with Grandpa—"

"And I think it is a great idea," Grandpa Arnold laughed back over his shoulder.

They were walking along the Old Trail, Indian-file, Jo, Jerry and Rosy Posy, with high boots and warm wraps buttoned tightly under their chins.

"What did you figure out?" asked Rosy, running ahead to take Aunt Dot's hand.

By this time they had reached the rock-pile by Willow Stream. The wind was quite blustery and cold. But the sun shone down, warming the earth into soft, spongy patches. It made the rocks an inviting place to sit and talk.

"At first I couldn't quite think how it would turn out," said Aunt Dot. "Then, there it was, all as clear as day. Since Jackie couldn't go to our woods, our woods would have to go to him. At least a part of it."

"Why Aunt Dot!" the twins exclaimed together.

"Of course," said Grandpa Arnold, "we never pick any flowers, nor dig up roots, without permission, in other folks' woods or fields. But we could very carefully transplant some of the ferns and wild flowers from our own woods into Jackie's yard. Then when the warm days come, he could

sit on his porch and get acquainted with some of the things we see along our Old Trail."

"Then I thought we might make a pool, and plant some of the wild flowers that attract these birds and butterflies," said Aunt Dot.

"And we could make some bird-houses to set around in the trees," said Jerry, eagerly. "And then we could get some snakes and turtles and things to live by the pool so he could see them."

Jo had been sitting up at the top of the rock-pile very quietly, as the others talked. Suddenly she said, "I know what let's do! All the times we've had Aunt Dot or Grandpa tell us about the treasures we've found. Let's take them to Jackie, so he could study them, if they're alive. We could get some books and magazines too, from the library. So he could find out more about them."



THIS TIME THEY HAD REACHED THE ROCK-PILE BY WILLOW STREAM

"Oh, oh," said Jerry. "What'll we look for first?"

"What should we look for in March?" Grandpa Arnold asked.

"Well," Jerry answered, thoughtfully, "the leopard frog will be coming out from the mud at the bottom of the spring. The salamander will be crawling out from under the rocks or stumps. And pretty soon the snakes'll wake up and the turtles."

"But those are all, 'after-a-while-things,'" said Rosy, thoughtfully. "Can't we find things for him right now? I know—let's make a shelf outside of his window, so he can feed the birds." She was so excited her words fairly tumbled over one another.

As she spoke, Jo came clambering down from the rock-pile and spun a little circle in the soft earth with her heel. "And tack up evergreen branches to make it look like the woods," she laughed. "And put out suet and maybe nuts for the squirrels."

"Let's see what our feathered friends like to eat," said Aunt Dot. "Those that eat insects, the nuthatches, chickadees, jays, kinglets, woodpeckers and creepers, like suet or most any kind of meat scraps from the table, or nut kernels. They might even relish a piece of bread with peanut butter almost as much as you do. Birds like the tree spar-

row, song sparrow, grosbeak, purple finches and juncos, that eat grains, would like all kinds of seeds, cracked corn, weed seeds, or maybe sun flower seeds, and, of course, bread crumbs."

"Oh, I just can't wait to get started," squealed Rosy.

Jerry had been scraping away among a pile of leaves with a forked stick. "And here's our first treasure to take to him," he laughed, hiding something in the palm of his hand. "I know it's a little underground cradle of some sort. I'm going right over to his house now, and give it to him."

(To be continued)

THE SQUIRREL'S TAIL

By ESTELLE HOOD

The squirrel has a warm fur coat
As soft as a baby's hair.
He has a fluffy, plume-like tail
Of which he takes great care.

So when he licks and rubs himself,
And cleans his shirt snow-white,
He briskly polishes his tail
To keep it fine and bright.

Sometimes his tail a rudder is,
Which guides his course on high,
When e'er he leaps from tree to tree,
A-sailing in the sky.

Sometimes it is a danger sign

He lashes in his wrath,
When someone tries to gather nuts
Along the woodland path.

Sometimes it is a parachute
Which helps to break his fall,
When down he jumps from dizzy heights
To land upon the wall.

Sometimes it is a mackintosh,
Which keeps his back so dry,
When he must dig for buried nuts
Beneath a rainy sky.

Sometimes it is a downy quilt
And under it he curls,
When howling winds do shake his house
And snow about it whirls.



FLORENCE MOORE

The Desert Runner

By FLORENCE H. MOORE

Over white, hot sands he runs,
Steady and sure and fleet;
Needing little food or water,
Nor does he mind the heat.

For you see, within his stomach,
There are numerous natural cells,
In which he stores up water,
Like so many little wells.

Such is our desert friend—
Dependable, strong and true;
One is stopping now for rest,
And—is winking right at you.

PUZZLE: Find another camel, also the
five letters of his name.



A Program with a Purpose

By HENRY A. HOOVER

THERE is gradually being built up at the Stevens High School in Lancaster, Pennsylvania, an amazing Nature museum. And the process of its creation is providing an original and fascinating Nature study and science program that has now been going on for more than two years. Deft fingers, much patience and sustained enthusiasm have been the principal ingredients of this work, and all have been freely forthcoming from the students.

The variety of the material constituting this project may be gathered from the illustration. The leopard frog at the right skillfully shows the circulatory system of the animal, as well as its nervous and digestive systems. The little models of prehistoric reptiles have been nearly two

years in completion, but have been enthusiastically and faithfully done. The glaciated monadnocks, with their terminal moraines, lakes and cascades, furnish abundant visual material to explain how rivers are formed. The dissectible flower has removable ovary, seeds, petals and sepals.

In the two years this work has been going on more than fifty creditable items have been completed. The various exhibits have been modelled in clay, negative and positive casts have been made, and many hours' careful work in coloring have gone into this unique and permanently valuable work, which has received the enthusiastic congratulation of the Department of Preparation of the American Museum of Natural History.

PENTSTEMON

IN MAY the flowers of the little blue Pentstemon carpet many a dry, sandy spot in the higher regions of our land, matching the deepest of blue skies in their coloring.

The Pentstemon is a flower of the New World, but even here it is found in real abundance only in the region of the Rockies. There, there are many species, some only a few inches tall, others attaining a height of several feet, with colors ranging from light cream to deepest maroon. In Colorado alone are



By ESTHER E. REEKS

found thirty-seven varieties.

Pentstemons belong to the Figwort family and are closely related to the snapdragons of our cultivated gardens. They love high altitudes and may be seen far above timberline.

This flower derives its name from two Greek words, *pente*, five, and *stemon*, stamen, because of its five stamens. One of these is sterile and tongue-like, with hairs on the tip. Hence its common name, beard tongue, by which it is known to many flower-lovers.

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Ernest S. Clark, R. D. 72-A, Windsor, Conn.

(Continued from page 150)

Those who want to go "the fellow next door" one better, can do it easily with the latest frills in the realm of petunias.

I presume some critical judges of annuals will be shocked when I present plumecelosias as our second choice of showy garden plants. But what other flower brings us the brilliant colors, stately, upright habit of growth and the long blooming period of the "plumed" coxcombs? The Thompsons magnifica strain holds many orange and golden shades of barbaric splendor, while old "Chinese Wool-flower" serves as a brilliant scarlet danger signal that summer is on the wane.

It took us a long time to discover the many sterling qualities (even for indoor decoration) found in the newer colors of sweet-scented, flowering tobacco. Old *Nicotiana affinis* we have always esteemed for its steadfast friendship—it comes back year after year on its own accord. The new red-flowering kinds and "sandrae" hybrids carry stately flower stalks on plants of most symmetrical beauty.

Cosmos—Orange Flare—graced our garden for the first time last summer, and is bound to receive a rousing welcome in the future. Its marigold-like foliage and the fact that it was called a "dwarf" fooled us and it was planted too much in the foreground. But from the middle of July, until late October, it added blazing glory to the border. This all-American gold medal winner closed its 1935 season with all the triumphs and tributes that an appreciative garden public had in store for a truly extra early-flowering variety of a usually very late fall flower.

In our estimation a hedge is always superior to a fence or a wall to mark the boundary of one's lot or to decorate the home grounds. A well-kept hedge is a trim and lovely thing. There would be more hedges, perhaps, if more people knew how to grow and care for them. These observations are inspired by an excellent little booklet just come to hand entitled *A Home Owner's Manual of Hedges*. It is the work of Marian Burcky, L. A., who discusses the charm of hedges, high ones and low ones, designing and shaping, shaped shrubs, planting, trimming and care. A listing of hedge plants is included. This booklet is available at ten cents a copy. We will be pleased to forward the dimes of interested readers to Nature Magazine to the publisher.

For outstanding contribution to wildlife conservation, the Hornaday Medal was recently awarded to Hugo Zeiter, Eagle Scout of Danville, Illinois. Active in furthering bird protective legislation in Illinois and the establishment of sanctuaries in the eastern part of the State, Mr. Zeiter has also played an important part in mobilizing the Boy Scouts of that region as conservationists. He is a member of Piankeshaw Area Council, Boy Scouts of America. Congratulations, Mr. Zeiter, on this rare honor.

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Nature Magazine in School

A Department of Aid to the Teacher

Birds and Serpents

This article, as its title indicates, deals with the balance of Nature. It requires background for its interpretation and so it would be more useful in the secondary school than the elementary. It could be read and discussed by general science and biology classes to determine what real understanding these pupils have of relationships of the different classes of animals, and the resulting balance of life. The snake should not be wholly condemned. In sections where the useful king snake occurs, the economic value of this reptile should be presented. Snakes make interesting pets and may be easily kept in a terrarium or empty aquarium, by providing drinking water in a pan, some pieces of rotten wood under which they can crawl and by occasional feeding. By watching such a pet it is possible to learn many facts about the adaptation of the snake, such as:

The snake walks on its ribs, pulling itself along by means of the heavy scales on the underside of the body.

Its underjaws are hinged so that they separate, allowing an object larger in diameter than the snake to be swallowed.

The Case of Canis Lestes

This author has shown one of the most efficient ways to combat the ignorance and prejudice responsible for much of the destruction of wildlife. Not every school could have a pet coyote; however, normal schools and teachers colleges in the section of the country where he is a native should certainly have one. Through daily association with this and other animals there should develop in the minds of the young teachers a degree of understanding and appreciation of living creatures that could only be approximated through reading. Under such influences, they would become ardent advocates of conservation and this subject would receive its share of attention in classrooms.

Fishes, Beware the Fungus

This is an article in which there are many suggestions to teachers in both the elementary and secondary schools. In the elementary school the aquarium is considered to be one of the best of devices for the presentation of ideas pertaining to the balance of life. From time to time the fish inhabiting it may become hosts to the unwelcome fungus guest described in this article. Such a situation affords a splendid opportunity for pupils to do some good scientific thinking in trying to determine the cause and cure for these white, thread-like growths. In one classroom where the pupils had noticed the fungus on the fish in the aquarium, they watched it for several days with growing concern. They advanced ideas regarding the cause of the growth. They read everything they could find on the subject. When they read that it would spread throughout the body of the fish they were much worried because their own observations were bearing out this

In order that teachers and parents may further use *Nature Magazine* as an aid to the study of Nature and Science, this page is devoted to the following brief notes based upon articles in this issue and suggesting ways in which they may be used as a source of inspiration and information. To bring these Nature study thoughts to our readers we have obtained the services of one eminently qualified for the task, and this department is edited

BY ESTHER SCOTT

Instructor in charge of Elementary Science
Washington, D. C., Schools

thought. They experimented with the salt water solution to try to cure the fish. They became interested in the methods of reproduction by which this fungus was able to spread so rapidly. This article would be most valuable in such a study as this. The illustrations in the article, as well as views through a microscope, if one is available, could be used by pupils in making their own drawings of the types of reproduction represented by this plant. Pupils could find other examples of each of these methods of reproduction and discuss the effectiveness of each in maintaining the population of the species represented.

Gila

This is a pet about which it is much better for most of us to read than to encounter in actual life. Adventurous spirits among our pupils might find keen delight in reading such an article as this. In fact, it might serve as a lead to the confidence of some difficult child. In classrooms where there are captive lizards or where the subject of reptiles is under consideration, pupils would find in this article much valuable information delightfully expressed regarding the habits and adaptations of the Gila Monster. They could compare these with those of the lizards native to their communities. It would be interesting to find out if these reptiles were as dexterous as Gila in squeezing themselves through a narrow space.

Flower Cinderellas

This article suggests those annuals which are favorites with the younger generation as well as the older. In the article entitled "Solving Seed Catalogue Puzzles", which appeared in the February issue, some activities were given that would apply equally well to this. In March, however, in addition to the planning of the garden, it is usually possible to start preparing the soil and planting. If the ground can be dug without becoming muddy, the earlier sweet peas are planted the better. Other seeds need to wait until danger of severe frost is past. Most school grounds have enough space for a flower border either close up to the sunny side of the building or next to a wall. In regions of clay soil, there is real danger in

working the ground when it is too wet, thereby converting it into a concrete-like material into which it is practically impossible for roots to penetrate. In such localities the condition of the soil may be determined by squeezing some of it together and then dropping it roughly. If it falls apart readily the soil is in condition to work. If it remains in a sticky ball, it is too wet even to be walked upon. The significance of this fact will be realized if such a ball of clay is allowed to dry. If the soil in the resulting hard ball is broken up, it will still be in lumps. However, if it is frozen (I hesitate to suggest using the electric refrigerator but it would serve the purpose), it will be found upon thawing and drying some to have returned to its original friable condition. In this way the frost of winter may wipe out the mistakes made in the garden in summer.

Sanctuary or Slaughter Pen

This article suggests looking for bird concentration areas in one's own community. With the help of an interested adult, pupils might be able to determine the location of such concentration areas in migration season, the species of birds, to some extent the number of birds and the relative number of and effect of enemies in the region. They could map out areas for possible sanctuaries. After careful study based on accurate observations and an insight into possible fluctuations in the balance of Nature such as might be caused by great changes in temperature, in moisture conditions, the introduction of new species, the destruction of food supply and nesting sites, they could write up rules and regulations for the maintenance of these refuges. Perhaps some of the government departments dealing with such work would be willing to criticize the whole set-up. Some schools would want to present their matured plans to garden clubs, Audubon Societies and other groups and ask their aid in actually making the plan a reality.

New Boundaries for Old Constellations

The new boundaries will be of vital interest to the astronomer. The old constellations about which many delightful legends have been told will continue to be of great interest to children. Younger pupils enjoy listening to these stories and being shown the star pictures in the night sky. Since it is necessary to be able to locate the points of the compass in order to find the constellations, it is often best to begin with the circumpolar group. Pupils may be introduced to these stars through the story of the bear and of the queen in the chair. Later they can find out where to look for these stars by pointing to the north, by determining the relative distance that the pole star is above the horizon, by being told the number of stars in the big dipper and its relation to the pole star. After they have had an opportu-

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ity to observe, it is interesting to have them draw a diagram of the big dipper. As the dipper has an hourly as well as seasonal change of position, the time of observation must be noted carefully. In consequence of these factors, the making of a diagram of the dipper affords experience in some exact observation. Since the polar constellations as well as the rest of the stars appear to rotate about the north star as an axis, it is possible to represent them by making a movable chart, the sections of which revolve about an axis representing the pole star. With such a device it is possible to change the position on the chart of any constellation to correspond to a particular season or hour.

Nature Trail

Using relief workers, the Normandy High School of St. Louis has been able to develop a Nature Trail of outstanding value. In fact its success is such that a little pamphlet has been published about the project, which was under the direction of Wendell F. Shay, Hermann Schwarz and the P.T.A. of the school. We quote from this pamphlet in part:

"In laying out a School Nature Trail it should be borne in mind that the natural elements must be supplied, such as various kinds of rocks and soils, shady nooks and open places, marsh and aquatic conditions.

"The first planting of the Trail is of great importance. It should contain trees, shrubs, herbaceous, marsh and aquatic plants—of course, all of them wild and native to the locality where the school is situated. Insects and other forms of animal life will find their way into such retreats so that scarcely any introduction of these is necessary.

"The development will show the struggle for existence, Nature's methods of pollination, seed dispersal, insect metamorphosis, the relationship or ecology of the inhabitants and other activities without end. In other words, the School Trail will be an invaluable adjunct to the Nature class-room and laboratory, wherein the student will come in actual contact with Nature. Ample opportunity is provided for the growing of marsh, as well as aquatic plants.

"In the pool various types of water animals are placed and let alone to carry on their existence in the most natural way. When once such a Nature Trail is established, the important thing is to let it alone and let Nature take its course, so that the effect of one thing upon another may be carefully studied and noted.

"Any interference with the natural processes of such a garden would thwart the real objective. Whatever happens is a lesson in Nature-study. If the inhabitants die or prosper, the reason for it must be checked up; and this in itself is a splendid exercise in observation and investigation. Correct observing and reporting are of inestimable value in the life of the student. Studies of plant and insect behavior can be carried on here with considerable facility. The struggle for existence is given free reign, and the lesson drawn from this source will always remain with the observer. Here it is not a matter of creating a garden of beautiful plants and formation of flower beds that will be a delight to the eye, but instead it must be a place wherein Nature's work is supreme."

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Hiking and Camping Forum

Conducted by
ERNEST A. DENCH

Hiking and camping inquiries will be answered by mail if a stamped addressed envelope is enclosed. Address the Forum editor.

Brevities

Truck trail mutilation of the Adirondack wilderness is now a *lively* controversy in Adirondack Mountain Club circles. . . . A club offers an eleven miler as a "short all-day hike." A beginner's appraisal would be half the distance. . . . Sectional squads are systemizing trail maintenance in Georgia Appalachian Trail Club territory. . . . To ensure fresh but unsour milk for several days on a camping trip, use a forty percent solution of formalin. Three or four drops to each pint of milk will suffice, without changing the flavor. Your druggist has it. Approved by Camping Club of Great Britain and Ireland. . . . Blackhawk Trails Club (Illinois) is experimenting with Saturday afternoon trips. . . . Whistling failed to carry far enough when a married couple became separated on a Yellowstone Park camping trip. An improvised tom-tom—forceful beats of a hunting knife against an aluminum cooking pot—performed the joyful reunion. . . . The country's champion high peak bagger is A. H. Marshall, who has climbed the highest mountain in each *high* state in the Union. No state with an elevation less than 7000 feet has tempted the intrepid Mr. Marshall. . . . *Hobnails and Brogues*, a British club magazine, might exchange with *Canal Boats*, its American contemporary as yet unborn. Not only did Long Trail (Vermont) foot traffic increase last season, but owners of aforesaid feet helped the footwear industry by making longer trips. . . . Youthful campers who know their stuff should result from the educational innovation of the East Rutherford (N. J.) High School. There is cooking class for boys only, and instruction in camp cookery is included. . . . "Let the leader lead" is the most difficult rule to enforce in a club of experienced hikers. Good sportsmanship is a realization that qualified members have their turns at leadership. At other times they are privates.

March Gadget List

1. Honey is a versatile sweetening agent in the camp commissary. Some cooks object to honey because it makes a dish *too* sweet. Correct method of using is to *drizzle* the honey, pre-warming it for ten minutes in lukewarm water. This process produces *thin* golden threads instead of *thick* ones. A folder, *Honey Helpings*, is refreshing for its commercial honesty.

2. A southwestern firm specializing in Mexican foods includes, in a recipe booklet, a plan for a unique campfire picnic.

3. The most sumptuous camp equipment catalog Forum editor has received hails from an old-established British house. Tent selections vary from ultra-lightweight luxury class to medium-weight, or family, models. Pocket stoves and portable ovens are among other listed items.

4. A hand ax (weight 27 oz., length 13½") liked by Forum editor because it really gives a vigorous swing on a log. A one-piece tool of steel, with grip part of handle inlaid with hickory.

5. Luggage carrier innovation which fits, by vacuum, to top of automobile. Claims to transport 400-500 lbs. of camp equipment in 11 sq. feet space area. Can be used as a table in camp.

Further details of above items promptly mailed if a stamped addressed envelope accompanies the request.

Ski Annuals

Origin of the word "gadget" is now being debated in an advertising weekly. Claimants aver it is a nautical term originated in 1870. Be that as it may, gadgets and technique are synonymous with skiing. Each school of thought expounds its case, with waxes as the heavy storm center.

All you wish to know about such involved matters are in the 1935-6 American and Canadian ski annuals. The first, price \$1.00, is sponsored by the U. S. Eastern Amateur Ski Association, Bellows Falls, Vt. The second, price 50 cents, is distributed by John Lovell and Son, Ltd., 423 St. Nicholas St., Montreal.

Forum's Own Medicine

The Forum is now conducting, in the Metropolitan New York area, a series of semi-wilderness one-day hikes primarily for beginners, or for those who enjoy leisurely-conducted trips of from 6 to 8 miles with congenial companions.

Ernest A. Dench is trying out new clothing and equipment items on these trips. He is also making camp cookery experiments with new food products and recipes. The Forum will benefit from these practical tests.

The winter series concludes in early April, but another series is planned for spring and summer. The trips should interest Forum readers residing within 50 miles of Manhattan, or who expect to visit here in the near future. Inquiries to Forum editor.

Black Hills of S. D.

Two of Margaret S. Bridge's seven years in the Black Hills of South Dakota have proved fruitful in introducing both residents and visitors to the untouted points of interest in their midst.

A ski-cruising trip along old wagon roads dating back to ox-team days, when mining machinery was hauled to the then active mines, placed the Black Hills Outdoor Club on an organized footing. This was followed by climbs of the high peaks in the vicinity.

Several are 7000 feet or better, South Dakota's top-notch being Harney Peak, 7244 feet.

Last fall the BHOC tackled the south slope of Spearfish mountain by a short, steep trail blazed two years previously by Mr. and Mrs. R. M. L. Underhill, of the Appalachian Mountain Club. The Black Hills form a region of rich geological interest, with opportunities seldom found to the same degree elsewhere because of the region's closeness to the frontier.

Hazards of 1876

According to Marjorie Hurd in *Appalachia*, lady climbers in 1876 or thereabouts needed jack knives to dislodge fragments of their trailing dresses from protruding stumps and rocks. One amateur stylist created, as a practical compromise, a full—very full—garment based on the bathing suit of the period. It was not until 1914 that women started to dress sensibly for the woods and mountains.

Although the author keeps a straight face to her audience, the two artists responsible for the sketches run the gamut from chuckle to a guffaw.

In this annual *Appalachia*, editor Ruth Gillette Hardy introduces a wide range of subjects from the Pemigewasset (Maine) wilderness in 1869 to modern ski togs.

Fruit Cheese for Lunch

Mrs. Alice Anderson's all-in-one lunch is so the Forum editor understands, famous in Appalachian Mountain Club circles. Thomas Dreier, whose *Troupadour* magazinelet glorifies New Hampshire, is a fruit cheese addict, and is not averse to telling the world about it. Mrs. Anderson's recipe reaches the Forum by this roundabout source.

This fruit cheese is a minced preparation composed of equal quantities of figs, dates, apricots, prunes and raisins. A small portion of each of grated orange peel and the juice are added for true piquancy. Mrs. Anderson is painstaking about the blending, done with a heavy fork, and then cubed, rolled in powdered sugar, and toted in a cake tin on the next day's hike.

Off to Tasmania

Were it not for the distance, Forum readers would flock to the "Most Mountainous Island in the World." The Tasmanian Government Tourist Bureau claims this possession, and, to strengthen the evidence, the Hobart Walking Club submits three issues of *The Tasmanian Tramp* annual.

Ten minutes' ride on a street car after leaving the boat at Hobart, Tasmania's largest city, and one has his pick of 365 different one-day hikes. Tracks abound on Mount Wellington, 4166 feet, and there is also the local brand of bush scrambling for those who prefer it.

Undiluted wilderness conditions prevail in the Cradle Mountain-Lake St. Clair reserve, a trackless area of 200 square miles. Peaks rise here between 3290 and 5020 feet.

(Continued on page 188)

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A Dragonfly Lays Its Eggs

By John Warren Johnson

It was a warm desert morning. The brilliant sun beat down relentlessly upon the tent. The barren slopes of the Panamint Mountains west of Death Valley baked in the bright sunlight. Craving a cool, refreshing, drink, I stepped from my tent and walked to the tunnel in the hillside hidden behind the stunted willow bushes. From it issues a feeble stream that pours from a sunken pipe into a ditch that conveys the water to the well. Barely two inches wide and a quarter of an inch deep is this tiny stream. It is one of three moist spots in eighty square miles of desolate hot desert.

I filled the rusty tin can beside the spring and raised it to my lips. As I did so, I heard a fluttering against the dirt walls of the narrow furrow in which the stream trickled. Looking over the rim of the can, I saw a handsome dragonfly, the largest I have ever seen, poised over the water. How strange it seemed—a dragonfly, resident of marshes and willow-grown pools, in this sunburned land.

Its delicate wings, beating invisibly, held it over the water. It bent its long, yellow and black mottled abdomen downward almost vertically, then began its egg-laying, the first I had witnessed. It hovered over the water with the tip of its heavily-laden abdomen barely above the surface, then dropped itself downward, punching the tip of the abdomen through the thin film of water into the mud. This it did with such energy that the water soon became roily.

I continued my drinking, then remained quiet that I might not disturb the pretty insect. Already it had punched its way along the stream about twelve inches. Finally, finding a place that satisfied it, it remained almost stationary. It was like a weird dance, a grotesque insect rite. Steadily it rose and punched its slender abdomen downward into the mud. Several times it struck pebbles that disturbed the regularity of its ovipositing and caused it to shift its position.

I began to count. Already it had laid some thirty or forty eggs. One, two, three; regularly; a little faster than one each second, it placed its eggs. One hundred, one hundred and fifty, two hundred, and yet it had not tired. The sunlight filtering over the edge of the tunnel and downward through the green willow leaves glinted on its transparent wings, cast a blue sheen on its plump thorax, and gave a brighter tint to the black and yellow abdomen.

At last I counted two hundred and seventy-one ovipositings. I shifted my position to the other foot. The slight movement frightened the insect. With a flick of the wings it lifted from the seepage and slipped away into the sunshine. I paused yet a moment in the cool shade. I wondered at the insect discovering this tiny trickle where it laid its eggs. In eighty square miles of desert it had searched out this water that a new generation could be assured, that its race might live.

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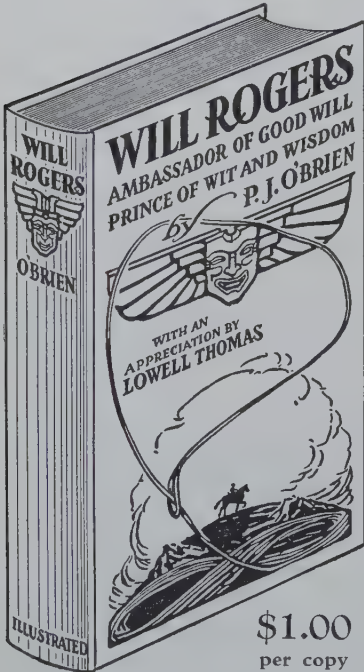
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Hiking and Camping Forum

(Continued from page 186)

Five of them—two virgin—were scaled on a five-day trip by a HWC party.

These Hobart hikers are polygamous in their love for Anne. Seriously concerned about Anne's future, one scribe admits that "it is best for Anne to be little known; better than if Anne were charted and contoured. Some may be rebuffed by the scrubs and hard packing, for it is only by contending with uncertainties that the real pleasures of pioneering and exploring can be found." Mount Anne, 4500 feet high, is encircled with bush of such severity that a mile and a half is deemed a good daily dose.

No mention of Alpine equipment or conditions is made in any of the HWC chronicles, so the physical hardships are evidently due to excessive bushwhacking and the toting of heavy loads so far from the base camp. Boggy plains divide both the ranges and individual peaks.

There are parts of the Tasmanian wilds like ours, in their concessions to civilized comforts—tracks with either hotels or guest houses at daily walking distances apart. Tasmanian trails seem to be marked with poles inserted in the ground.

But the trampster in search of adventure will pick the unexplored areas shown on the map of this Australian state.

Trails Over Private Properties

The Careless Campfire Custodian, Bottle Breaker, Paper Bagger and Tin Canner are the greatest obstacles to hiking trails being permitted over private lands. Owners of wild tracts fear the injurious aftermath of undesirable people attracted by the easy-to-follow footpath.

A compromise which might be successfully proposed to the landowner is the erection of entrance and exit signs, as follows:

"PRIVATE PROPERTY—

Mr. John Blank kindly allows the Beckerton Trail to be routed here, provided there is no picnicking, camping, hunting, fishing or trapping. It is to be used as a *continuous* passage, except on a written permit. Violations will result in the trail being closed to all."

The written permit clause will give conscientious hiker-campers the chance to secure camping privileges under rigid conditions. If the tract is in a popular week-end region, the local club should offer a patrol service.

Another winning point in dealing with property owners is a *portable* trail marking technique—metal or painted linoleum discs on trees and fences, supplemented with cairns. No permanent traces (except, of course, the trodden-down passage—and Nature will eventually attend to that) of the new trail will remain if unfortunate conditions compel its removal at any time.

Food For Three Days

Eight ounces each for breakfast and lunch, and from nine to eighteen ounces for supper, have proved satisfying on a three-day hiking trip of the Mohawk Valley Hiking Club, Schenectady, N. Y.

Each of the nine meals had a different set-up, and those for the first day are given below:

Breakfast:	Ozs.
Bacon (4 slices)	2
Flaked eggs (2)	1
Bread roll (1)	2
Butter (1" x 1" x 1")	1
Concentrated coffee	1/2
Powdered milk	1/2
Sugar	1
	8 ozs.

Lunch:	Ozs.
Prunes	2
Caramel	2
Nuts	1
Fruit Cookies	3
	8 ozs.

Supper:	Ozs.
Macaroni	4
Bacon (2 slices)	1
Cheese (1" x 1" x 2")	2
Tea (tablet)	
Bread	2
Jam	1
Sugar	1
	11 ozs.

Supper rations on the third, and last, day, jumped to eighteen ounces. Cause was a 10 oz. can of whole kernel corn—only canned product on commissary list. Can container added about four ounces more to the total weight. A more practical arrangement would have been to switch the corn to the first day's supper, saving two days' haulage of precious ounces.

The nine meals required the following: 6 lbs. of produce per person:

	Ozs.
Concentrated coffee	1
Tablet tea (4 tablets)	
Sugar (24 small lumps)	6
Powdered milk	2
Pancake flour	4
Raisin fruit cookies	8
Bread rolls (2 seeded)	3
Bread (nut whole wheat)	8
Prepared cereal	2
Honey	4
Jam (Strawberry)	4
Butter (one bar)	4
Dried prunes (large)	5
Seedless raisins	2
Figs	2
Macaroni (elbow length)	4
American cheese	4
Whole kernel corn	10
Onion (1)	2
Flaked eggs (6)	3
Chocolate	4
Caramel	6
Mixed nuts	3
Sliced bacon	5
	6 lbs.

Above weights were, of course, exclusive of the containers.

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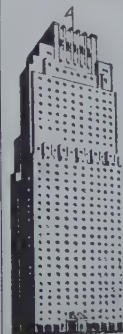


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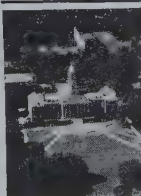
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A Cat's Joke

By Rev. Henry M. Ladd

We lived in the country in a big house which stood on a bluff overlooking Long Island Sound. The ceilings were so high that it was quite a climb from the kitchen to the second floor, and the maids grumbled if grandmother rang for them too often, as it seemed to them. All the bedrooms were on the second floor and opened into a large hall. Near the head of the stairs was the bell for calling up the servants. It was a primitive affair—a round disk with an arm, to the lower end of which a wire was attached which ran down the outside of the wall and then through a hole in the floor to a bell in the kitchen fastened to a big spring on the wall which kept the bell jangling when once set in motion. You pulled down the handle and let go and the bell in the kitchen rang.

The bell would ring and a servant would race upstairs to my grandmother's room on the second floor with: "What is it, Madam?" "I want nothing. I did not call you." "But the bell rang, madam." "I did not ring it." Well, that sort of thing went on until it was getting on the nerves of mistress and maids. The solution came accidentally. One day father, coming out of his bedroom into the hall, heard the bell ringing. He stopped and looked down the hall to the bell, and there sat Ben, black cat, head cocked on one side listening. As the door at the head of the kitchen stairs did not open, puss raised his paw and struck the bell-wire. No answer. Again he struck the wire and the bell rang. On hearing the maid open the kitchen door into the hall, puss started to steal away. At that moment father came up, and shaking his finger said, "Ben, I have caught you. If you ever ring that bell again I will whip you." "Wow," Ben replied.

Now, believe it or not, the bell never rang again unless rung by a human. Who says cats have no sense of humor, and that Ben did not enjoy a joke?

Ben had plenty of intelligence and used it like many humans to further his own selfish ends regardless of the voice of conscience. He loved oyster soup. So did my mother. Mother did not love Ben. Indeed, she was afraid of him, and Ben knew it and made use of this knowledge.

In some way or other Ben always knew when oyster soup was being prepared for mother. Mother was ill and confined to her bed, so he would steal unseen into her room and hide under the bedstead. The very moment, however, the maid closed the door into the hall, having bolstered mother up in bed and put the tray with the plate of soup on her lap, out would come Ben, hop upon the bed, and proceed at once to lap up the milk. If mother dared to protest, up would go his good right paw with every claw exposed accompanied by a throaty growl, and mother would subside and submit. What else could the poor lady do, with all the family downstairs? Should father or the maid come to remove the tray, Ben was off the bed like a shot as soon as he heard their footsteps on the stairs, and the moment the door was opened away Ben fled down the hall to the kitchen, or up into the big rambling attic.

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ness for oyster soup and the mean way he took to get it. He knew he was doing wrong. He was willing to pay the penalty if caught—he would take a chance on that. But, right or wrong, he must get his share of mother's oyster soup.

Sierra Hiking Trips

For something new in vacations, we suggest the seven-day hiking trip announced for next summer by National Park Service in Yosemite National Park. Under the leadership of a ranger-naturalist, one has the opportunity to learn to read the trailside and enjoy the beauty of the out-of-doors as exemplified by the rugged mountain scenery of the central High Sierra.

Parties leave Yosemite Valley every Monday morning during July and August, staying each night at one of the High Sierra Camps maintained and operated by the Yosemite Park and Curry Company. Comfortable beds and bountiful meals are provided at the nominal rate of \$1.00 each, bringing the entire week's outing to a cost of around \$25.00. This enables one to travel light, carrying only a change of hosiery and other personal articles. These High Sierra Camps are located within easy hiking distance of ten miles or less per day enabling both young and old to make the trip without undue fatigue. The short distance between camps offers sufficient time for side trips, if desired, and fishing in the many streams and lakes in the region.

Parties are limited in number to fifteen so reservations should be made ahead of time through the Park Naturalist, Yosemite National Park.

Poems of Color

Paul Southworth Bliss and Harold J. Matthews have again collaborated in producing a charming little volume of verse with the title *Cirrus from the West*. Mr. Bliss is the poet; Mr. Matthews the illustrator. Together they produce something that is charming to read and to look at. This is a book of Nature poetry by one who knows and feels the more subtle charms of the outdoors. Somehow, however, quoting from these poems apart from the setting in which they appear in the book, or away from their fellow poems, does not seem to do them justice. Rather would we suggest investing a dollar and one-half and enjoying them all. The publisher is the Lakeside Press, Chicago.



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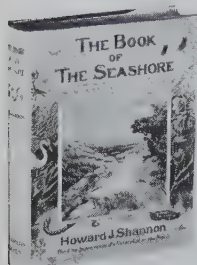
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DR. ROY WALDO MINER

Curator of Marine Zoology, American
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Yosemite School

Announcement is made of the twelfth ses-
sion of the Yosemite School of Field Natural
History, which will be conducted this sum-
mer in Yosemite National Park from June
22 to August 8. This National Park Service
school is designed to train students in meth-
ods of interpreting living nature. Close to
fifty percent of the male graduates in past
years have secured employment as temporary
or permanent naturalists or rangers in var-
ious National Parks and Monuments.

The number of students is limited to
twenty and there is a prerequisite of suffi-
cient educational background for admission.
No tuition is charged and expenses are ex-
tremely reasonable. Field work predomi-
nates, a week being spent in the biotic re-
search area and two weeks on a pack trip
studying the flora, fauna and geology of the
High Sierra. The staff that shares in the
instruction is a distinguished one.

Full details about the course, together
with application forms, may be obtained from
the Park Naturalist, Yosemite National Park,
California.

Wildlife Head

Dr. Homer L. Shantz has been appointed
Chief of the Division of Wildlife Manage-
ment of the United States Forest Service
effective June 1, 1936. He leaves the post
of president of the University of Arizona to
accept this post. This division has been re-
cently expanded under reorganization of the
Forest Service.

Nature Course

An outdoor course in natural history will
be given from July 5 to 18 by the Division
of General Education of New York Univer-
sity. The headquarters will be at Farming-
dale, Long Island, New York, and informa-
tion may be obtained from Miss Farida A.
Wiley, American Museum of Natural His-
tory, 77th Street and Central Park West,
New York City.

Folk-Lore

Folk-Lore from Adams County, Illinois,
by Harry Middleton Hyatt, is published as
a memoir of the Alma Egan Hyatt Founda-
tion, of 114 East 76th St., New York City.
Within its 700 pages are recorded more
than ten thousand numbered items of say-
ings and beliefs that were gathered from
the inhabitants, mainly of European descent,
living within the ten square miles about
Quincy, Illinois. The items are grouped
under various headings, those given pre-
cedence in the book being those relating
to weather, wild and cultivated plants, in-
sects, birds, reptiles, mammals, and other
wild and domesticated creatures, in all cov-
ering about 100 pages. Then follow the items
relating to home, family life and personal
activities. The book comes from the press
of The E. Cabella-French Printing and Pub-
lishing Company of New York City and the
price is six dollars.

National Park Poems

A first prize of \$25 and other subsidiary
prizes are being offered by *Horizons*, a mag-
azine of western poetry, for outstanding
poems about our western National Parks.
Full details may be obtained from that pub-
lication at 935 Muirfield Road, Los Angeles,
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Photographic Notes

BY SAMUEL BROWN

Pets

A never-ending source of interest is our pets. Those of us who have a cat, a dog, a bird or any other animal that we have learned to love, have an opportunity to take pictures which we should not neglect. These photographs will brighten up the album and make it more attractive.



"SNOOKY"

Owners of single lens cameras can take excellent outdoor pictures of pets without fear of under-exposure.

Animals are never camera shy and therefore one of the greatest difficulties is not present. Each situation will present its individual problem in the shutter speed required, critical moment and a number of other factors. For this reason it is hard to generalize, but here are presented some ideas for taking such pictures.

If your dog, for example, has learned some tricks, a series of snaps can be taken of him "rolling over" or "begging." These pictures, mounted as a strip across one of the pages in your album, will add interest and variety to your collection.

When your dog is unusually frisky, a short shutter speed must be employed. Very rarely is it necessary to use less than $\frac{1}{100}$ of a second while in most cases $\frac{1}{25}$ of a second is sufficient. After determining the necessary speed, the diaphragm must be set at the proper stop. The brighter the day, the smaller can be the stop and the greater will be the depth of focus. When in doubt, use a larger diaphragm opening. It is always better to overexpose a little than underexpose.

If the pet is a child's companion, do not neglect to take a snap of them together. Such a picture will increase its sentimental value.

Our dog "Snooky" has had her picture taken since the day we got her as a pup, only six weeks old. She has always been a subject for my camera and hardly a week passes that she does not have her portrait taken. One morning I found her sitting in a beam of sunlight near the window and an exposure of $\frac{1}{30}$ of a second captured her picture. At another time, a friend visited me and brought his cocker spaniel. While a merry time was had by both dogs, I kept snapping away and got a number of interesting shots.

Cats usually find a spot which they call home and can always be found there in an interesting pose. Their curiosity is proverbial and remembering this, one can find much to photograph.

Canaries, parrots, love birds, pet rabbits and any animal which has been accepted as part of the family should be photographed. Perhaps you have a bird who is permitted to leave its cage in a well lighted room. Take its picture! One of the most interesting pet portraits this writer has ever seen was of a canary perched on a head of lettuce.

Since the introduction of photoflood bulbs and super-sensitive panchromatic films, photographing indoors has become a simple matter. Now anyone owning a camera with an F. 6.3 lens or faster can take advantage of this type of photography. Snapshots at $\frac{1}{25}$ of a second are possible.



"SO-O-O-O TIRED"

A touch of humor is always interesting. Try dressing the cat or dog or rabbit in glasses, pipe and cap or push him into a boot, if the unfortunate animal is small enough, and snap its picture.

The owner of the single lens camera will find it a great help if he purchases a portrait attachment. The average price of these is \$1.00 and they permit taking close-ups. They will be found indispensable in photographing small animals and flowers.

A tripod will be found handy when you know where your subject will stand.

There is available, from this department, some copies of "Snapshots Indoors At Night." Its illustrations and diagrams will help you to photograph your pets by artificial light in their most interesting poses. Please send a stamped self addressed envelope.

* * *



"THIRSTY"

The pictures reproduced herewith were taken by the author with a National Graflex camera on super-sensitive panchromatic film.

* * *

Camera Types

In our previous technical discussions, various parts of the camera, including lens, shutter, finder, etc., have been analyzed with a view toward helping our readers make an intelligent choice when purchasing equipment. There are several types of cameras on the market, each with a specific advantage and each best adapted to the work for which it is designed. These cameras will be briefly discussed in this and in subsequent articles.

Undoubtedly, the greatest number of



"SNOOKY AND NIGGY"

persons who take pictures own box or single lens folding cameras using roll film. While somewhat limited in scope, this type of camera will yield a greater percentage of good results in the hands of the novice than would a better instrument, due to the simplicity of operation. These instruments are sometimes referred to as "fixed focus cameras" because the lens remains the same distance from the film and in this position always in focus.

Single lenses usually have a working aperture of between F. 11 and F. 16 and shutter is timed at approximately $\frac{1}{25}$ of a second. With the wide latitude of present day films, this stop opening and shutter speed will serve for most outdoor picture opportunities during the middle hours of the day (10 A. M. to 2 P. M. in winter; 9 A. M. to 3 P. M. in summer).

Because of the small lens aperture, these cameras have remarkable depth of focus; subjects ten feet and beyond will be sharp. For closer work, portrait attachments are available.

Better single lens cameras have a sliding diaphragm to secure smaller stop opening and adjustment for time exposures. They obviously, increase the use of the camera. Recent models have built in portrait attachments and yellow filters.

The owner of a simple camera should deny himself the pleasure of taking pictures of winter and summer scenes, animals, flowers, etc. His equipment is well suited to this work.

* * *

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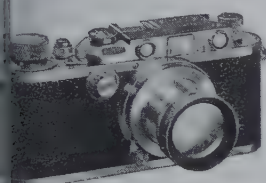
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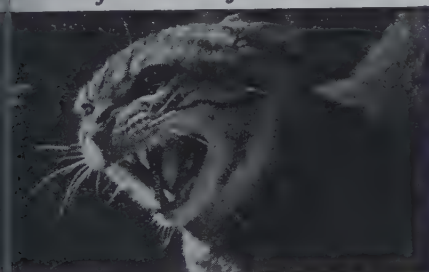


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Ed. Wolff & Associates, 428 Taylor Building, Rochester, New York, advertising agency handling the account of the Bausch & Lomb Optical Co., would like photographers to submit good photographs of outdoor life suitable for the illustration of binocular advertising. Bird, game, sports and marine photographs, or any subject in which binoculars could be used to advantage are desired. Photographs submitted should carry prices.

* * *

Photographic Enlarging by Franklin I. Jordan, F. R. P. S.—224 pages, 60 illustrations. Published by the Folmer Graflex Corp., Rochester, New York. Price \$3.50.

In *Photographic Enlarging*, Mr. Jordan has filled a gap in the photographers library. Besides being entirely authoritative, it is one of the few reference books that one starts at the beginning and reads through to the end. One is struck immediately by the author's experience and knowledge; his explanations are easily understood by anyone who has the most elementary knowledge of photography. Its nineteen chapters cover enlarging from every point including, equipment, paper, the negative, manipulations, combination printing, art, etc. A notable feature is the Appendix which contains a formula, helpful hints, and many useful tables. All in all, *Photographic Enlarging* is conducive to better work.

* * *

Each year brings with it a number of books devoted to the work done by outstanding photographers of the day. One excellent example of this type is found in *Modern Photography—1935-1936*. Illustrated by the foremost photographers in the world, it is an inspiration to anyone owning a camera. One of the features of this book is that most of the photographs were taken with amateur equipment. Ninety-five full page illustrations, many of which are of Nature subjects, with complete data for each, comprise the main portion of the book. A well worth while addition to the photographer's book shelf.

Published by Studio Publications, Inc., 381 Fourth Avenue, New York, N. Y. Price \$3.50 in cloth binding; \$2.50 in paper binding.

* * *

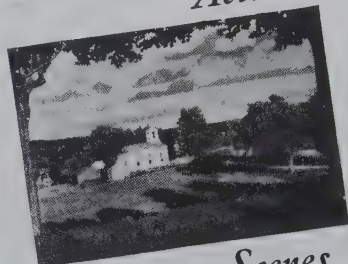
Photography enthusiasts are polishing their equipment for the spring season. Snow scene specialists must have had their fill by now, the past winter being what it was, but now it's the spring photographer's turn. The photographic department of Nature Magazine is devoted to its readers interested in photography and maintains a service which renders assistance with any photographic matter. You are invited to take advantage of this service. Address all photographic inquiries to Samuel Brown, Nature Magazine, 1214 Sixteenth St., N. W., Washington, D. C.

Cordially,
SAMUEL BROWN

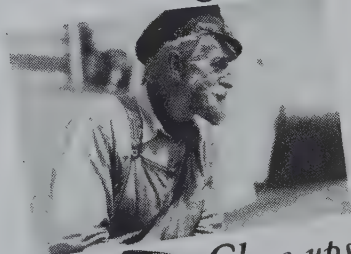
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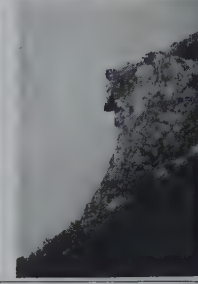
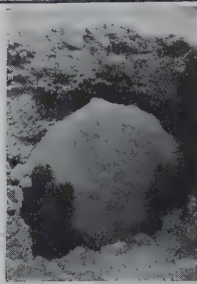
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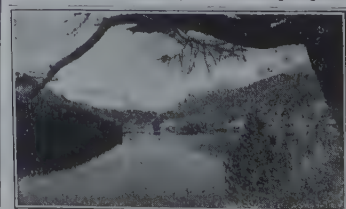
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A Strange Battle

by Marion Deane

Who would ever suspect a toad of fighting? It sounds incredible, but they do fight savagely, although but few people ever see them. The mating season of our garden toad is in May and June, and each year at this time they come to our lily-pool to sing to their prospective mates.

Last spring when busy about the garden, I noted that the singing had ceased and a great commotion was on. I was quite surprised and astonished to find three toads engaged in a heated battle.

Two of these lively fellows were trying to finish one of their brothers. They chased him about the pool, snatching and biting at his legs as he swam, and tearing at him in a most vicious manner.

I decided that the victim had been punished enough, so I lifted the unfortunate one from the pool, carrying him to the other side of the garden. I hope that he learned a lesson.

Since I do not understand the toad langu-

age, I cannot tell what it was all about, but I strongly suspect that there was some other reason. *Cherchez la femme*, no doubt.

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In April

WHEN April comes, the uncertain months have gone for another year, not to return until fall. Though none can tell with confidence the character of any particular day in April, the month with all its frequent and sudden weather changes has a well-defined character consistent with changes. This consistency, covering as it does many variations unpredictable at the moment, has in fact an aspect of personality, and April alone among the months has been personified in a way that seems appropriate. Thus, W. W. Christman sings in his Songs of the Helderhills:

*I love April but I know
All her wiles—
April is a tender maid—
When she smiles.*

Furthermore, one learns to tolerate the apparently unpleasant aspects of this month much as one does the lesser qualities of a friend, and affectionately to speak kindly and apologetically of those characteristics that may be criticised. Perhaps thus some early lover of Nature phrased the rhyme "April showers bring May flowers"—which has been the proffered consolation to so many hundreds of boys flattening noses on window panes blurred with the apparently endless rains of April.

First month of unmistakable spring, April brings abundant evidences of new life—together with subtle and pervasive influences that are in the smell of spring coming from the damp earth warmed by an April sun, or in the mists and fogs rising from rain-soaked earth and making it impossible for the early-morning walker to be certain as to which tree or telephone pole marks the limit of actual, unimagined sight. The apparent evidences of the new season have the stimulating effect of something joyful, but the unseen influences, strangely enough, seem to promote pensiveness and a moodiness that ultimately reach their depth as rain patters on a roof some night following a day of steady downpour carelessly referred to as "showers".

Possibly the wonder, excitement, and strange sadness of April are most marvellously fused in the experience of one listening to the robin's song on a sunset evening after rain. Another artist, the wood thrush, sings also in April, back perhaps from a winter in southern Mexico or Central America, not like the hermit a transient, but like the robin a summer resident; and like the robin it sings also in its fullness, as the hermit does not until it reaches its breeding grounds. Other birds are back with notes of joy. The myrtle warbler is making its way to the North with brightness and cheer in its trill; a lustiness returns with the whippoorwill; and the Louisiana water-thrush brings a sprightliness in its presence and a stormy abandon in its song that seem to speak highly of Mexico, the region south to Colombia, and the Bahamas, as good places to spend the winter. The colorful waves

of warblers that come suddenly, overnight, include yellow palm warblers and black-throated green warblers on their way to nesting grounds farther north, and black and white warblers, some of which are satisfied to stay in more southern latitudes. Along shores least sandpipers and semipalmated plovers may be seen on their way northward, and the spotted sandpiper has again returned to its territory on the water front. In marshy and swampy areas the American bittern, back for the summer, is making that "booming" vocal performance that Bradford Torrey says "is best witnessed in spring, while the grass is still low". Overhead the swallows are again wheeling and swooping and sailing—barn, bank, rough-winged, and cliff swallows, and purple martins. And in the depths of the woods the oven-bird is again walking gingerly along the ground or, on a limb, is bursting into its inspired "out-pouring of intricate and melodious song". All habitats are indeed alive once more with birds.

Other forms of animal life also are keeping pace in April with the return of spring. Squirrels and raccoons have given birth to young in their tree homes, and in the muskrat's marsh hut there also are young mammals in April. Insect life is again stirring. By the end of the month many reptiles also have again come to active life, and in fact one of the most interesting experiences of the month in the woods may be a search for the source of a movement caused by a box turtle about its spring mating activities, ready to maltreat any other male of its kind that will stand up on three legs and fight for the reptilian equivalent of a sweetheart.

Aside, perhaps, from the return of the birds with their colors and their songs, the manifestation of Nature that most effectively spreads the message of returning life in April is in the blooms and the leaf growths of the plant kingdom. In our middle states more than three dozen trees and even a greater number of wild flowers are in blossom. The delicacy that seems to characterize the earlier flowers is in the demure wood anemone, the windflower, that grows in moist or low woodlands. The yellow adder's tongue, also in moist woods or in thickets, adds its dash of color to the spring, albeit with less of boldness than is in the bright yellowness of the swamp or marsh buttercup. The quaintness of the blossoms of the dutchman's breeches, with the luxuriance of its nicely segmented leaves, and the charm of the many kinds of violets, with their heart-shaped leaves, entice one again and again to the woods, while in the fields the triangle-leaved violets, the yellow blossoms of the cinquefoil, and the flowers of wild strawberries add to the lure of the outdoors this month. Indeed, April is a month of many flowers—large-flowered bellwort, wild ginger, meadow chickweed, early meadow-rue, bloodroot, early saxifrage, wild geranium, partridge berry, and certainly others—flowers that can not wait until May to make fragrance and beauty out of the showers of April.

—HOWARD ZAHNISER



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